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AMERICAN MACHINIST

A PRACTICAL JOURNAL OF MACHINE CONSTRUCTION.

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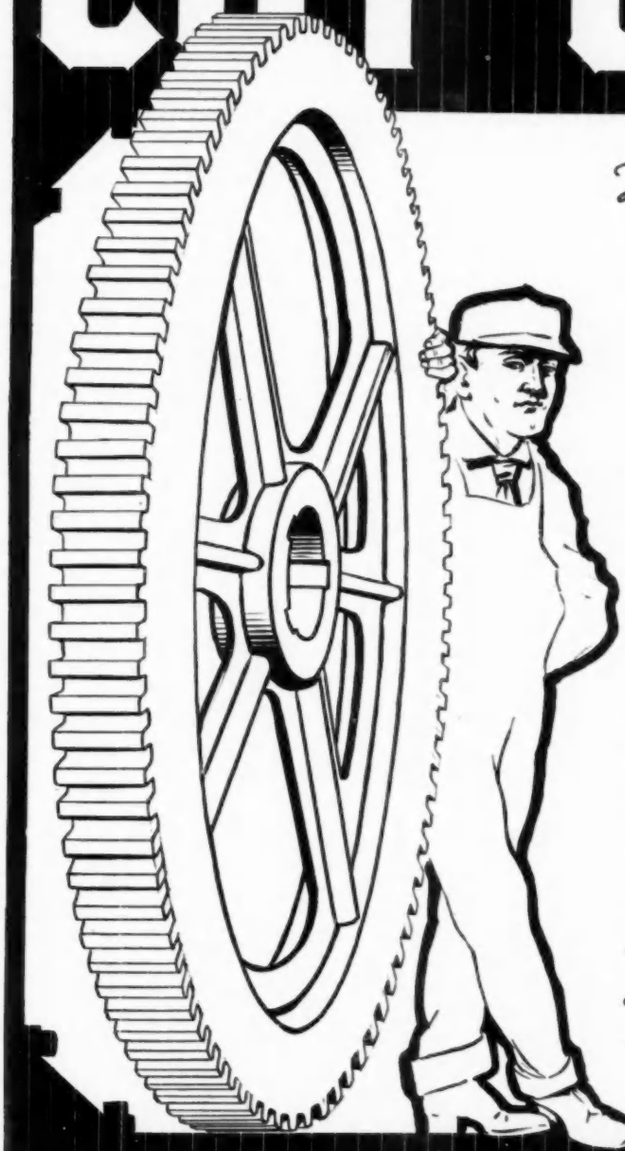
Index to Advertisers and Classified Index Following Reading Matter.

CUT GEARS



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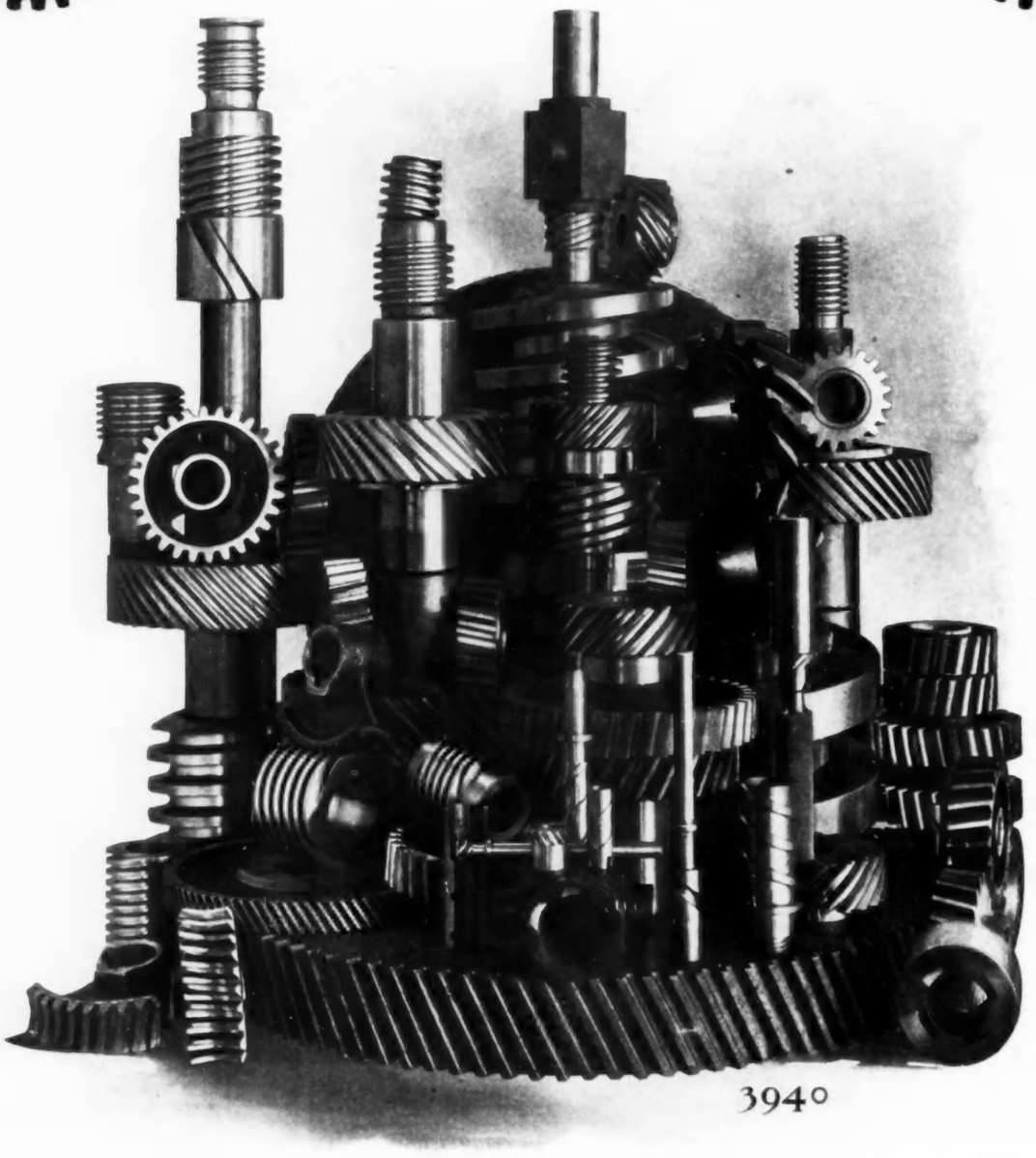

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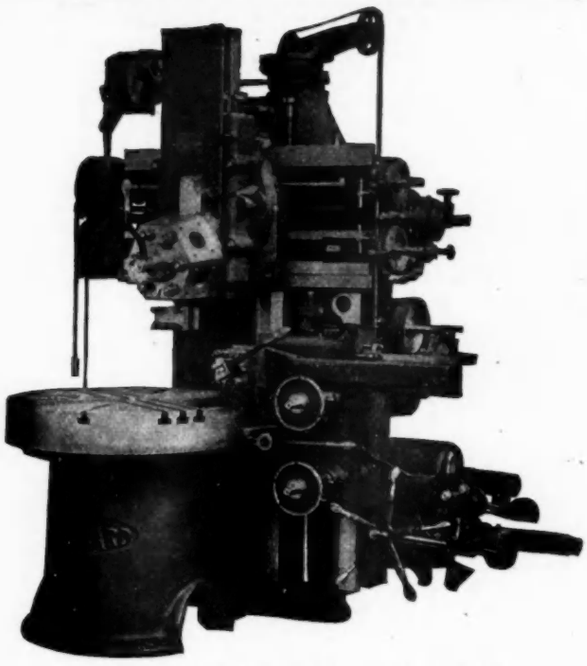

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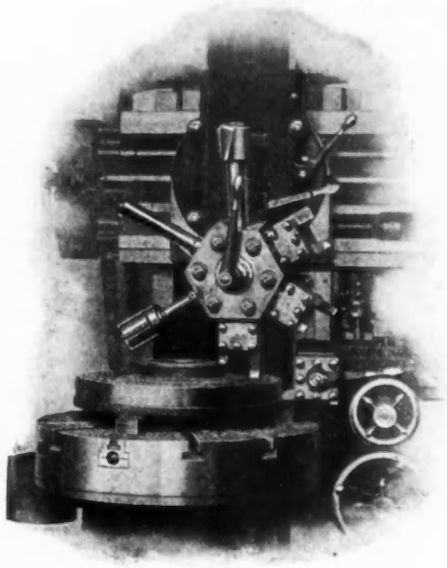

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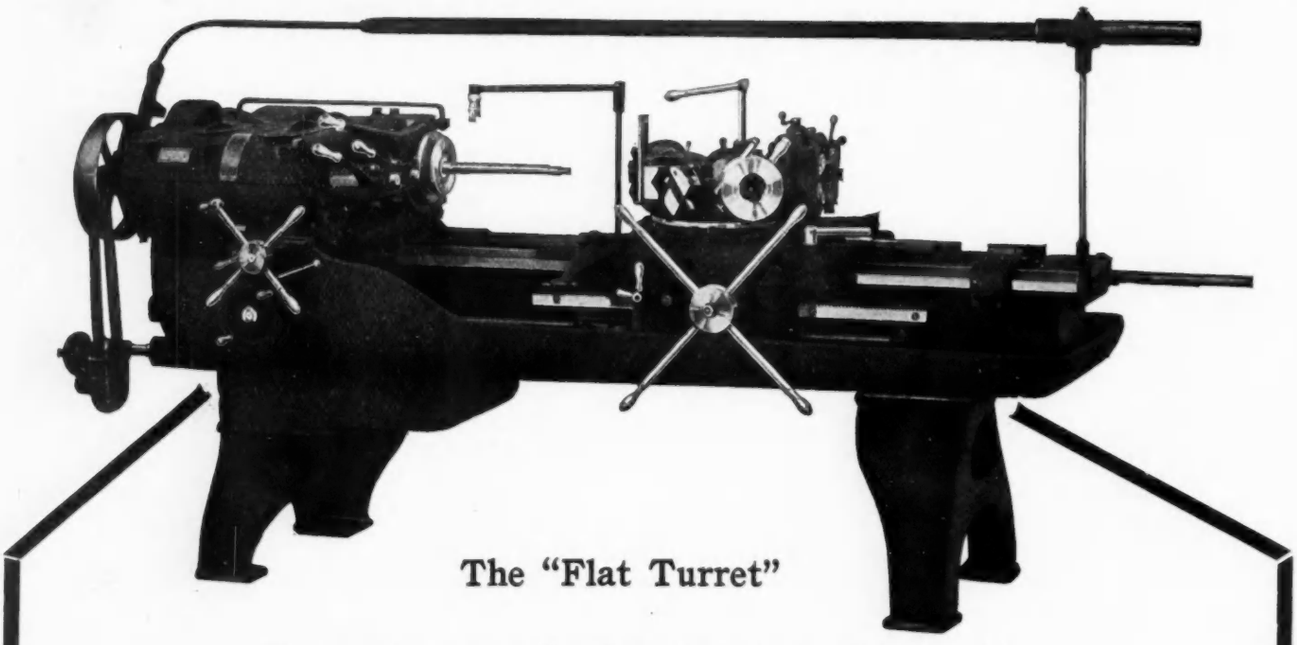

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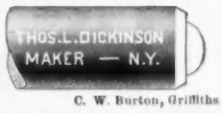

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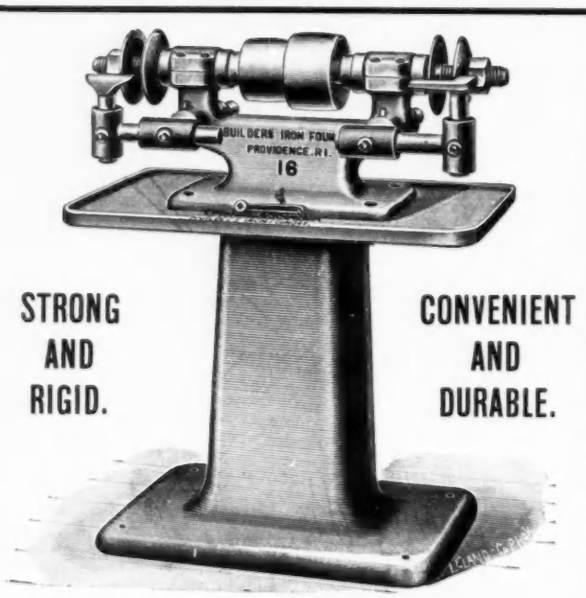

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The Machinery Club of New York

A New Center for Machinery Men with Commanding Views of the City and Harbor and Complete Facilities for Refreshing the Inner Man

BY FRED H. COLVIN

The opening of the Machinery Club on May 21 was quite an event in the machinery trade of the East if not of the whole country, as it forms a meeting place for all who are interested in this line. The idea originated with F. H. Stillman, president of the Watson-Stillman Company, who, on April 4, 1907, called a meeting which was the beginning of this club. It now numbers in the neighborhood of 1100 members, about half of whom are local and the remainder are divided among 127 cities, including those in Mexico, Cuba, Japan and European countries, and a large number of applications for membership are on file.

A unique feature of the club is that the organization can elect no honorary members, the honorary class being limited to the President of the United States, the Governor of the State of New York, the Mayor of New York City and the Major-General commanding the Department of the East, together with the Commandant of the Brooklyn Navy Yard. Another feature, in the grill room, is a large round table which is known as the "open table," where out-of-town members and others who have but a limited acquaintance in New York get together, as it is a rule that diners at this table may engage in conversation without the formality of an introduction.

The club occupies the two upper floors of the Fulton building, which forms part of the newly completed Hudson Terminal buildings located between Church and Greenwich streets and extending from Fulton to Cortlandt streets. This will be the terminal of the Hudson River tunnels connecting New York City and Jersey City and it is the plan of machinery dealers and firms having offices in New York to concentrate in this building both for the purpose of being convenient to the new club and also to be able to take customers to their warerooms in Jersey City in the shortest possible time, by using the new tunnels as soon as they are completed.

FIG. 1. THE BUILDINGS FROM THE RIVER. THE MACHINERY CLUB OCCUPIES THE TWO UPPER FLOORS OF BUILDING AT THE LEFT

Fig. 1 shows the buildings as seen from the river. The building occupied by the club is the one on the left of the picture, the club rooms being on the 21st and 22d, that is, the top and next to the top, floors. The roof-garden restaurant, which forms a unique feature, is between the two small towers.

The stranger in New York will be most impressed by the commanding view which he secures in any direction and particularly from the roof garden, which will be utilized for a dining room whenever weather permits. This overlooks the North river with its ever-changing panorama of shipping, from the commonplace tug and ferry boats, to the latest of the ocean greyhounds and, on a clear day, visitors see where the Narrows lead out to the ocean and as far up as the beginning of the Palisades on the Hudson, while in the distance the mountains of New Jersey loom into view.

Fig. 2 is such a view from the roof garden looking southwest over the Hudson river and upper harbor. In the extreme distance at the left is Staten island, with Bartholdi's Liberty in the middle distance to the left of the new West building. Architecturally considered, this is one of the most successful of the sky-scrapers when viewed from its river side. In the immediate foreground are the chimneys of the New York Steam Company, the location of the camera being well above their tops. Immediately opposite and to the right of the picture is Jersey City, the arched roof of the Pennsylvania Railroad terminal being barely visible. This building is also the Jersey City terminal of the tunnel of which the New York terminal is below the observer's feet. Immediately to the left of the Pennsylvaina terminal is the Colgate building with its 40-foot diameter clock dial, which was illustrated in our columns recently, but which does not come out in the picture.

Fig. 3 is from the same viewpoint looking northwest over the river and down on surrounding buildings, and the elevated

FIG. 2. LOOKING TOWARD JERSEY CITY

FIG. 3. OVER THE HUDSON TO THE JERSEY HILLS

railroad. It includes shipping from the American liner at the left to the "Lusitania" at the extreme right, with one of the Sound steamers in the center. Almost in the center of the picture on the New Jersey shore, and scarcely discernible through the haze is the Lackawanna Railroad terminal—the terminal also of a second pair of tunnels under the river which are now in commission—and just beyond are the docks of the North German Lloyd and the Hamburg-American steamship companies.

Perhaps an even more striking view is shown in Fig. 4, taken from the opposite side of the building and looking northeast. In the foreground we are looking down on the spire of St. Paul's church, noted as having had Washington as an attendant, as the burial place of Captain Lawrence of the ill-fated "Chesapeake," and of many other celebrities. To the left, in the form of a hollow square, is the old-time Astor House and just beyond it is the busiest post office in the world, while back of the church spire is the Park Row building with its two small towers which was the highest building until the Singer tower snatched away its laurels.

At the extreme right of the picture and in the distance is the Brooklyn bridge, at the left of which may be seen one of the towers of the Manhattan bridge now in process of erection. The Williamsburg bridge is directly behind the Park Row building, and at the extreme left and be-

FIG. 4. LOOKING DOWN ON THE SPIRE OF ST. PAUL'S

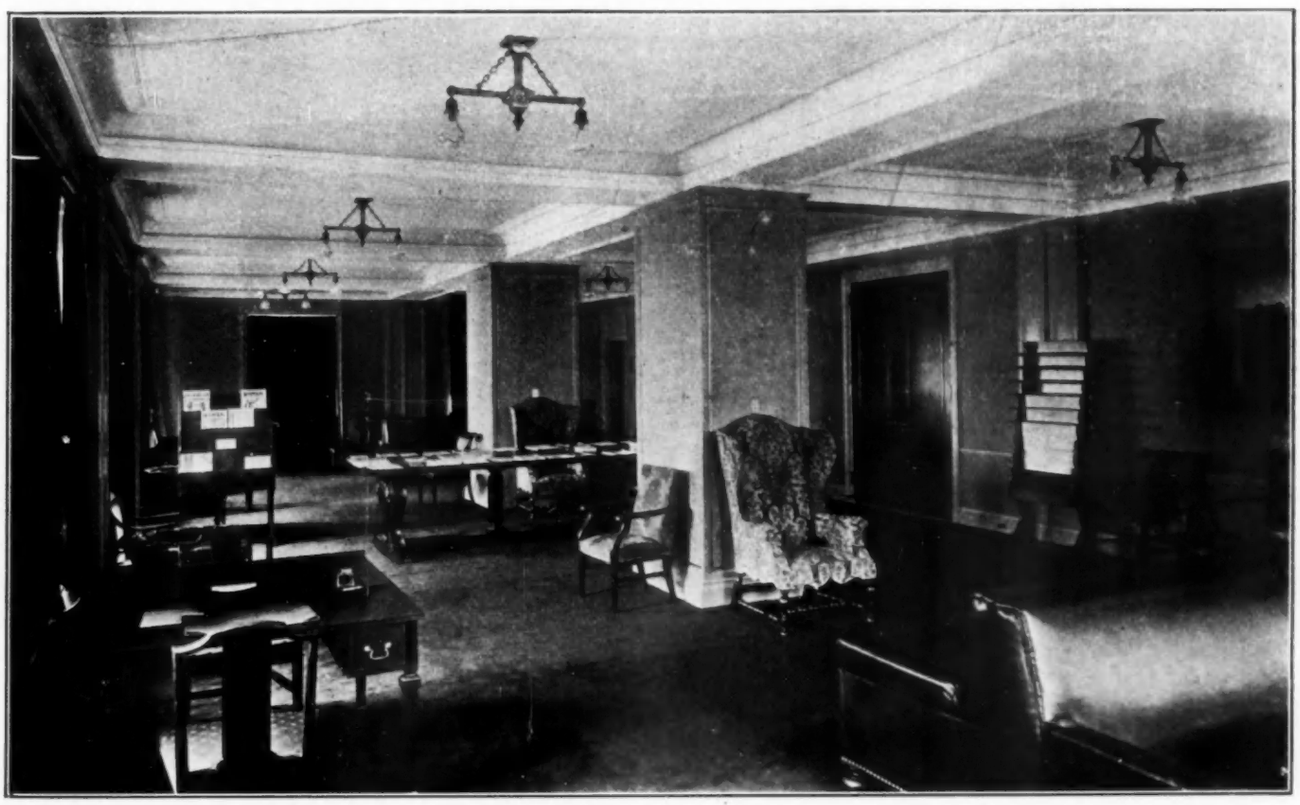

FIG. 5. THE RECEPTION ROOM WITH WRITING DESK AND CURRENT PAPERS

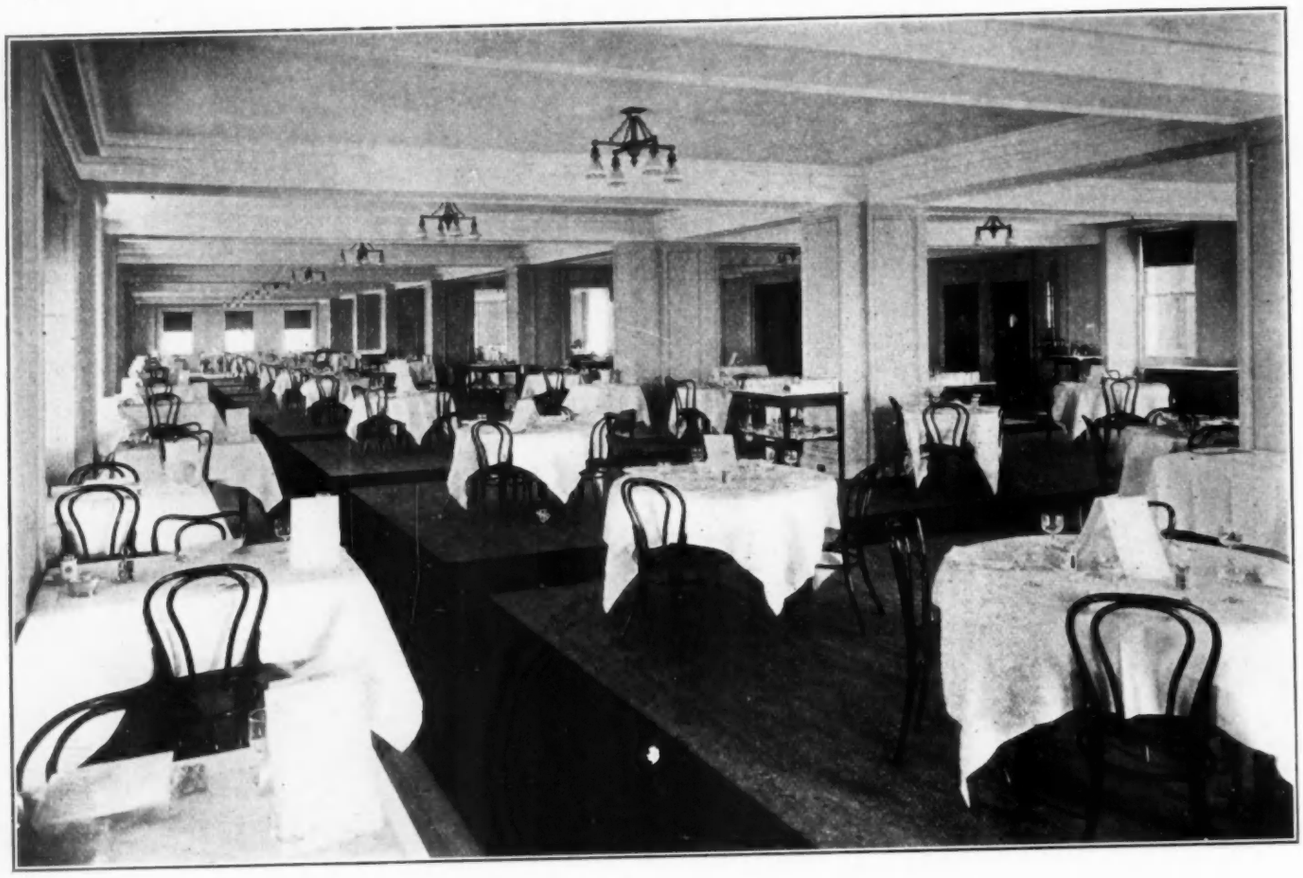

FIG. 6. THE MAIN DINING ROOM 50X150 FEET

FIG. 7. THE GRILL ROOM WITH PART OF THE OPEN TABLE IN THE FOREGROUND

yond the limit of the picture is the great Blackwell's island cantilever, which, while practically complete, is not yet in commission. Between the post office and the Park Row building is Park row, with the subway below its surface and rounding into Broadway, where the two streets join just beyond the church. This view gives an extremely good idea of the hight of the Machinery Club rooms and this insures at all times good light and air, as well as freedom from annoyance of noise, dust and flies. The main sky-scraper district begins immediately at the right or south here, as in the other views, can be noted the neat effect of the plain columns and girders. While this strikes one as being severe at a first glance, it is a decided relief from the usual attempt at ornate architecture and should be pleasing to all those who dislike seeing our forests denuded for ornamentation without useful purpose. Fig. 7 gives an idea of the reception room, in which there are conveniences for writing and where the various technical papers, as well as dailies, can be consulted.

We believe the club is destined to become very popular with machinery men from all over the world, and Mr. Stillman is to be congratulated on the successful carrying out of his plan.

of this picture, and striking as it is from many points of view, its latest structure, the City Investing building stands in a position to obscure most of the others from any point that can be obtained from the club's quarters.

The club rooms include all modern conveniences, such as private dining rooms, ladies' dining room, reception and smoking rooms, bath room, barber shop, etc. The grill room is shown in Fig. 5, part of the "open table" being in the foreground. The furnishings are of Mexican mahogany, the floor is tile and everything excepting the gear on the menu card is in strict accordance with mechanical ideas.

An idea of the extent of the main dining room can be had from Fig. 6, and

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According to the *Master Painter* a paint is ready for the market that will serve as an indicator of excessive heat in machine parts. When the parts covered are cool or normal the color is red, whereas when the heat becomes excessive it changes to black, and returns to the red color again when the machine is permitted to cool off. Parts of the paint are said to be mercuric iodide and cupric iodide mixed with distilled water in proportions that vary according to the heat that is considered permissible.

A Drill-press Job

By B. J. Williams

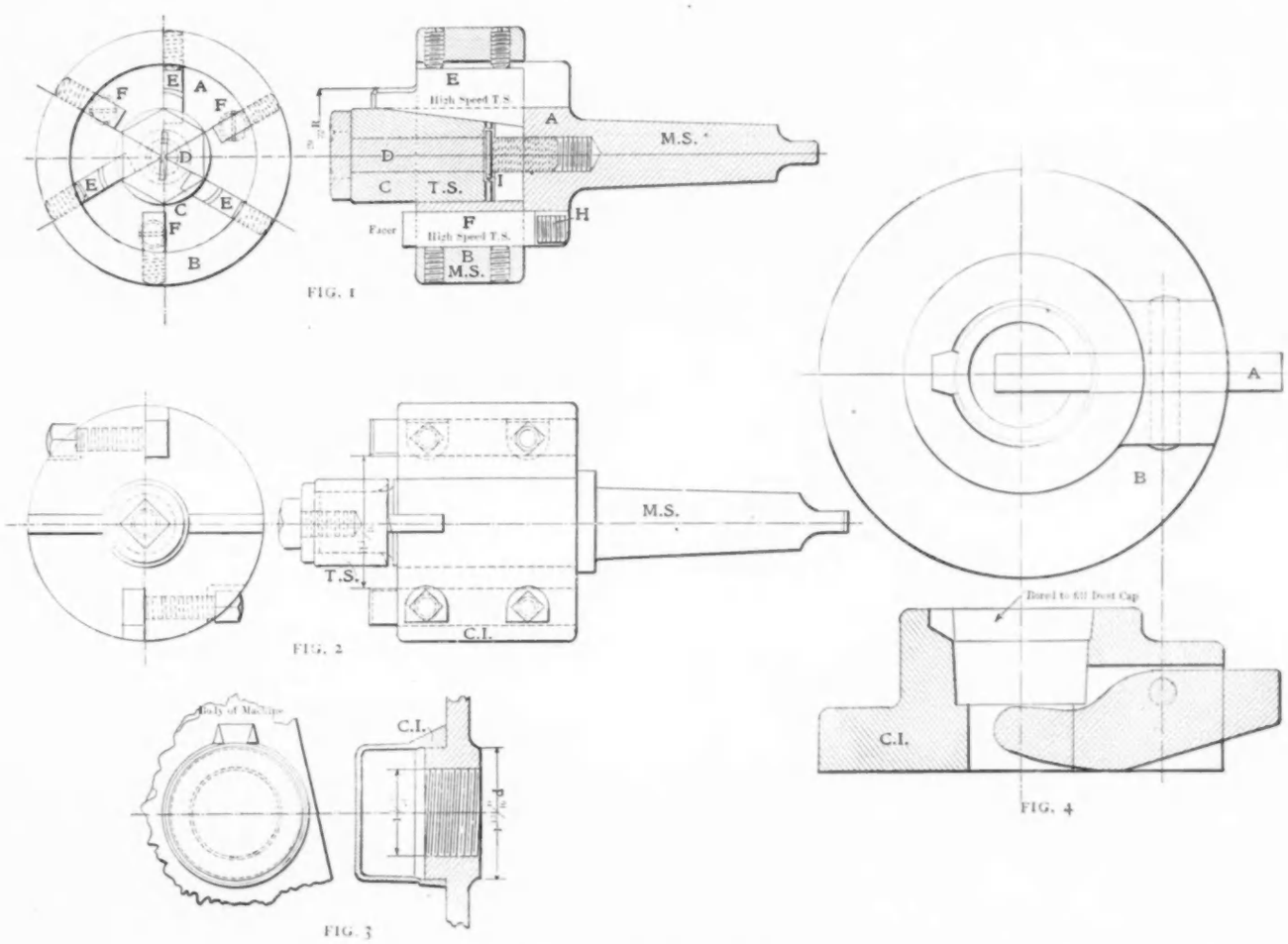
The following is a description with drawings of tools for a series of operations of boring, facing and turning, performed in an ordinary drill press.

The pieces to be machined were the body of a secondary machine, weighing about 48 pounds, a cast-iron cup-shaped piece shown in place on part of the body of the machine at Fig. 3. This piece serves as dust cap over a bearing for a revolving shaft, the bearing being screwed into the body of the machine by thread shown in Fig. 3.

The tool shown in Fig. 2 is for facing and turning the boss on the side of the machine, the body being laid in the jig on the drill table, and the boss turned and faced at one operation. The pilot is a steel bushing hardened and ground to size of the tapping hole in the body of the machine.

The drawing clearly shows the construction of this tool, and should require no further explanation.

In Fig. 1 is shown the tool for boring and facing the dust cap. The body *A* is made of a good grade of machinery steel, was first centered and rough-turned,



A DRILL-PRESS JOB THAT IS UNUSUAL

then run in the steady rest (to insure hole being in line with the center line of the body of the tool), and bored as shown. Three holes were drilled and tapped 7/16 inch and placed just where the slot for the facing tools would come. Then bushing *C* and screw *D* were turned and fitted and the slots were then milled, three of them being just deep enough to mark bushing *C*. The other three slots not so deep are for the facing tool. These slots cutting through the center of the tapped hole at the rear of the body as shown at *H*, Fig. 3.

The bushing *C* was then removed and the slots for the boring tools were milled deeper into the bushing at the angle shown in the drawing. The cutters were then fitted, and after replacing the bushing and screw, the tool was replaced in the lathe and turned at large diameter, the collar was then fitted and screws put in place, after which the tool was assembled and finished turning on centers. The screws *H* serve as backing and adjustment for facing tools *F F F*, while the tapered slots in bushing *C* afford adjustment for boring cutters *E E E*, as these cutters rest in these slots. The small pin *I* serves to withdraw the bushing.

Fig. 4 is simply a cast-iron chuck, bored to fit the outside of the dust cap and serves to hold the dust cap for facing and boring. The chuck is also fitted with a knockout for removing work. The chuck is simply clamped to the table of the drill press.

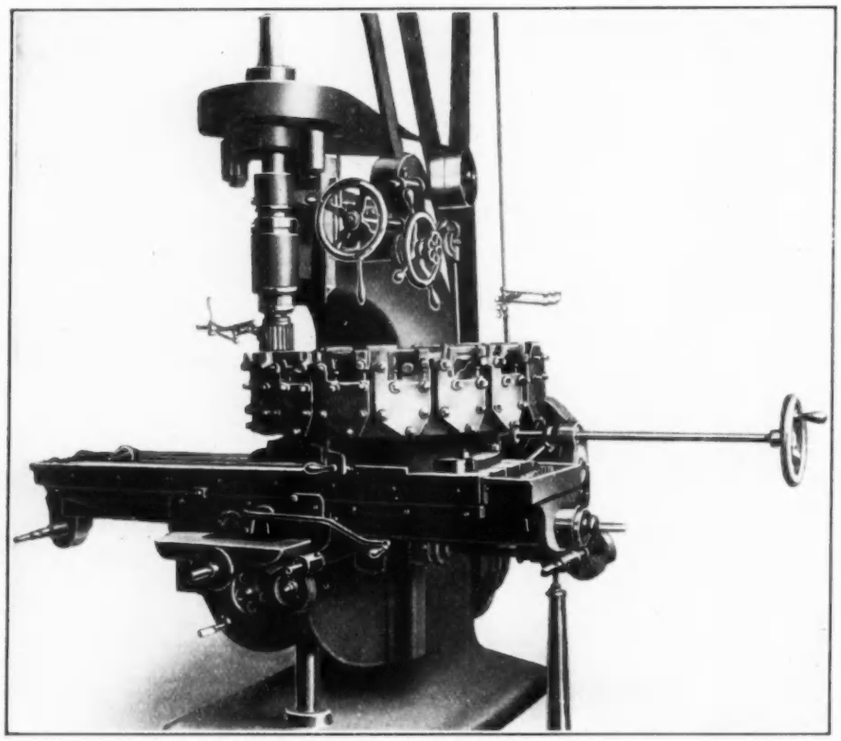
These tools have given general satisfaction, and up to date they have finished many hundreds of pieces.

A Rotary Milling Fixture

EDITORIAL CORRESPONDENCE

As most readers of the AMERICAN MACHINIST are aware, the Taft-Peirce Manufacturing Company, Woonsocket, R. I., devotes its energies to the execution of high-grade contract work of all kinds, including among other things the manufacture of special jigs and fixtures and special machinery. The company's plant is an extensive one, and an interesting variety of work is always under way in the shops, in various stages of construction.

A milling fixture designed and built by the concern some time ago is illustrated in the accompanying half-tone. As will be noticed, the fixture is mounted on the revolving table of a Becker-Brainard vertical-spindle miller, and is adapted to carry about its periphery a number of pieces requiring to be milled. These pieces are castings with a flat surface to be finished and a curved ledge which has to be milled to the arc of a circle, the cutter machining the two surfaces simultaneously. The fixture is rotated steadily, carrying one piece after another under the cutter, and the attendant as each completed piece passes from beneath the cutter releases the clamping fixture, removes the piece and clamps another one in its place; thus, the operation is kept up continuously, there being no time lost in stopping to remove the finished work and put in place the rough castings.



A ROTARY MILLING FIXTURE

A Chart for Belt Horse-power, Area of Cut and Weight of Metal Removed

BY J. J. DENSMAN

The accompanying chart has been plotted for the purpose of determining the power developed by any pulley, having given, the diameter, width, and speed from the following formula:

$$Horse\text{-}power = \frac{\pi\, D\, W\, R\, P}{33{,}000},$$

in which

D = the diameter of the pulley in feet,
W = the width of the belt in inches,
R = the revolutions per minute and
P = the pull of the belt in pounds per inch of width.

P has been taken at 40, 60 and 80 pounds (see chart at $A\,B\,C$) which will cover ordinary requirements.

In the case of lathes, boring mills and similar tools, the area of cut which can be taken, and the weight of metal removed per hour; in mild steel, 0.01 per cent. carbon and cast iron, will be found opposite any horse-power. These figures are based on the Manchester experiments of Dr. Nicholson. The cutting speed of 60 feet per minute has been chosen as a good average working speed, using high-speed steel tools. The area of cut for any other speed is in inverse ratio.

To use the chart find diameter of the pulley at the left, follow horizontally to the line for the width of belt, then vertically to the intersecting line for revolutions per minute. A horizontal line from this point will show horse-power, area of cut, and weight of chips from the data at the right.

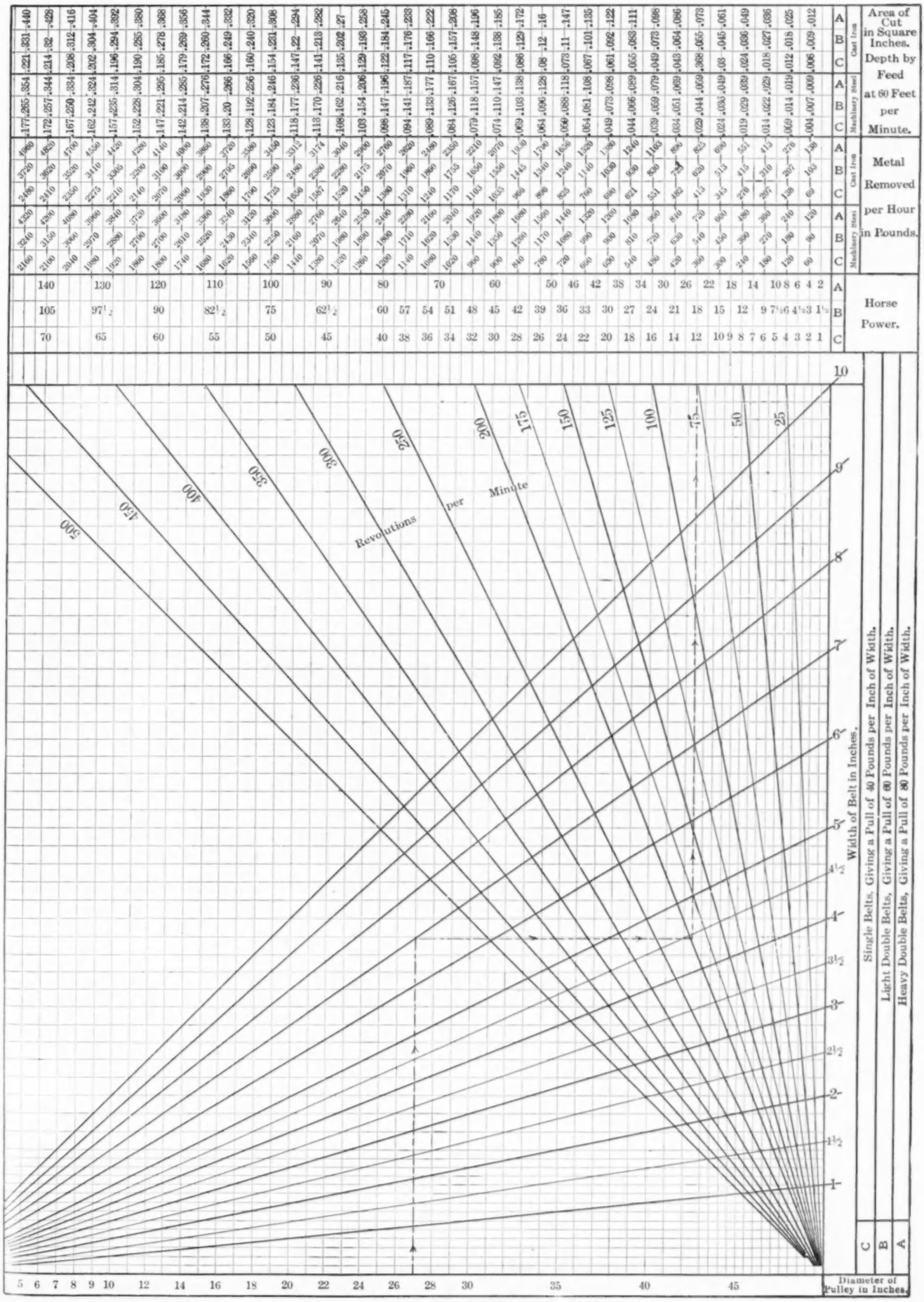
Example:

Given a pulley 27 inches in diameter and a 7-inch heavy double belt at 200 revolutions per minute. Horse-power equals 24, cut 0.059 square inches in mild steel and 720 pounds of chips per hour. If a feed of say one-sixth per revolution is available then the depth of cut equals $0.059 \times 6 = 0.354$ inches. If the cutting speed were 40 feet per minute, the area of cut would equal

$$\frac{0.059 \times 60}{40} = 0.0885 \text{ square inch.}$$

In lathes having more than one cutting tool, the area would be divided between them.

This chart has been used frequently in estimating, checking and computing and by such practical tests its accuracy has been amply proved. It is very easy to use and should prove helpful to any who have occasion to determine the horse-power required to remove a given quantity of metal, or the amount of metal which a given tool can remove under given conditions of cut, etc., or any of the other factors whose relations are established by the chart.


Area of Cut in Square Inches. Depth by Feed at 60 Feet per Minute.
Metal Removed per Hour in Pounds.
Horse Power.
Revolutions per Minute
Width of Belt in Inches.
Single Belts, Giving a Pull of 40 Pounds per Inch of Width.
Light Double Belts, Giving a Pull of 60 Pounds per Inch of Width.
Heavy Double Belts, Giving a Pull of 80 Pounds per Inch of Width.
Diameter of Pulley in Inches.

RELATIONS BETWEEN PULLEY DIAMETER, WIDTH OF BELT, SPEED, HORSE-POWER, AREA OF CUT AND WEIGHT OF METAL REMOVED

Building the Lucas Boring Machine

Some of the Interesting Details of Shop Construction, of Methods Used in Securing Accurate Work and Several Handy Kinks

EDITORIAL CORRESPONDENCE

The shop of the Lucas Machine Tool Company, Cleveland, O., has been developed after a well defined plan and ample provision has been made for its continued growth. Being in the outskirts of the city where land is obtainable, it is being developed on the one-story plan with sawtooth construction, and although some of the details of this have been improved from time to time, it presents a uniform appearance and is well worth the consideration of anyone starting a new shop.

All castings are delivered into a yard which is reached by an overhead track so arranged that the castings can go either into a storehouse or directly into the shop, as occasion may require, in either case the handling being reduced to a minimum. Fig. 1 gives a good general idea of the appearance of the shop together with some of the details of its arrangement, such as the benches in the aisles between the lathes and the grinding machines, temporary storing of finished or partly finished work on the vertical rod with a large flange base, the foreman's desk, which gives an unobstructed view in all directions, the storage of the feed-screws and similar stock in the rack beyond the foreman's desk, and the disposition of the line shafting under the roof truss.

In Fig. 2 is seen the erecting department, in which the construction is similar to the other, and at the extreme left is a temporary wall, or partition, which will be removed when the newer portions of the plant are completed. With this construction it is possible to make any addition desired in this direction without in any way interfering with the completed portion of the shop, and after the new part is ready for occupancy all that is necessary is to take down the partition and make any rearrangement of tools that may be desired. The erecting department as shown in Fig. 2 includes three bays, numbers 4, 5 and 6, and it will be seen that the line shaft runs directly under the roof girders, so as to be entirely out of the way of the traveling crane and to allow work to be handled clear to either end of the crane bridge when necessary. After the machines are erected they are belted to this line shaft for testing, the cone on the shaft being engaged by friction clutches. This shows four machines being tested and others in the background not quite ready for the test.

In Fig. 3 is a row of machines being erected under bays 5 and 6, and after being completely assembled they are moved under the testing shaft by the ratchet roller shown in the next figure. This also shows the only wall bench in the shop, where the small work is prepared before the machines are assembled, and the parts are stored so as to be convenient for the men who are erecting the new machines.

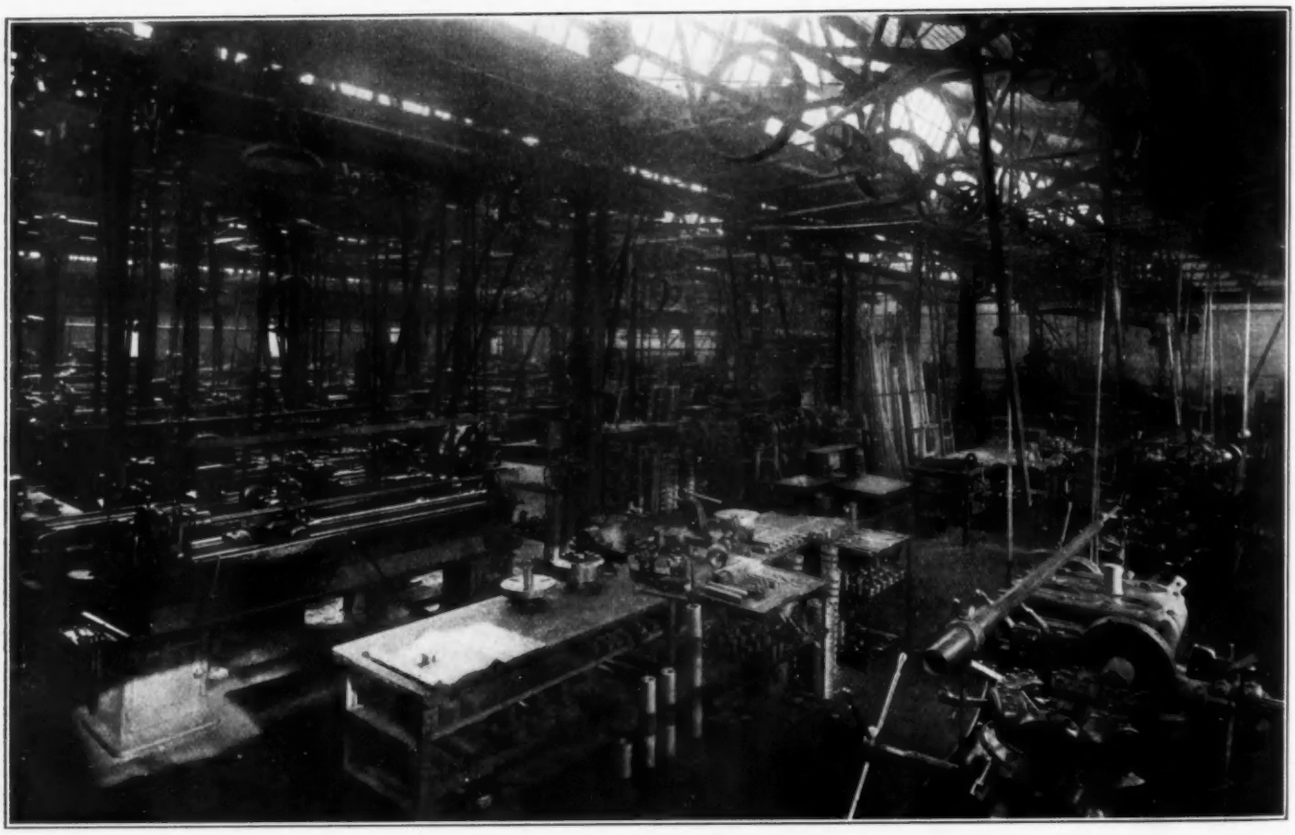


FIG. 1. THE GENERAL LAYOUT OF THE MACHINES AND SHAFTING

A comparison of the roof construction in Figs. 2 and 3 will show the advance that has been made in regard to fire protection, as in the former we have a roof of matched planks 3 inches thick, while in Fig. 4 no wood whatever is employed excepting the tops of the benches, the roof being of so-called book tiles 12x24 inches, supported on purlins and T-iron. This construction is being followed

FIG. 2. TESTING THE MACHINES AND SHOWING THE LIGHTING

FIG. 3. BAYS IN THE ERECTING DEPARTMENT

in the newer portion of the plant, and everything possible is being done to reduce the amount of combustible material in the shop at any time. It will also be noted that each bay is served by a number of small traveling cranes in addition to jib cranes, which are placed so as to not interfere with the overhead cranes in any way.

In the foreground of Fig. 3 is shown a rack for the vertical storage of bars and other long pieces. This is made of channels with holes tapped in the flanges for round pins which can be easily screwed in at different center distances according to the size of the space wanted. This is made entirely of metal.

These machines are handled very readily by means of the devices shown under the machine in Fig. 4. On the head end of the machine is a special ratchet-roller truck having wheels independent of the axle, so that either or both can be driven by using the rod shown. These in connection with the swiveling casters bolted under the other end of the bed make it possible to steer the machine in any direction and to turn it completely around in a very small space if necessary. This is an inexpensive device and at the same time one which gives excellent satisfaction and can be used to advantage in many places.

A jib crane is shown in Fig. 5, which also shows how the post is utilized for holding an upright and a head while they are being fitted to each other. The cross bolted to the column, supports the upright and is made to swivel so that the various surfaces can be brought into the most convenient position for being scraped. The hand-wheel shown on the head controls a rack-and-pinion attachment for moving the head along the face of the upright so as to show the bearing instead of being obliged to do this by hand, while the jib crane and hoist enables one man to handle the work easily and without the delay of securing a helper. This also shows a truck used for carrying finished spindles and a portable vise stand, which is quite widely used in the shop, as there are no benches in this department, except the one already referred to against the wall. The absence of benches allows free passage from one bay to the other for either men or work.

One of the interesting testing operations is shown in Fig. 6, where an upright is being squared with the bed. The bed is first squared on top and edges to surface plates and straight edges. The upright is then squared with the top of the bed in both directions. As the head is guided on the upright only by the left-hand edge of its bearing, this edge therefore is the one which must be square with the top of the bed. To insure this there are two castings of exactly the same size clamped to the guiding edge of the upright and all the squaring is done from these two pieces, as shown in the illustration being squared by the end of these pieces, and tissue paper is used in the usual way as shown. For squaring the other way the square is brought to the two square surfaces shown on the right-hand end of the pieces which are clamped to the upright, and the alinement secured in this direction.

The method of scraping in the platen is shown in Fig. 7. The bracket is bolted to the bed and acts as a fulcrum for the long lever by which the platen can be

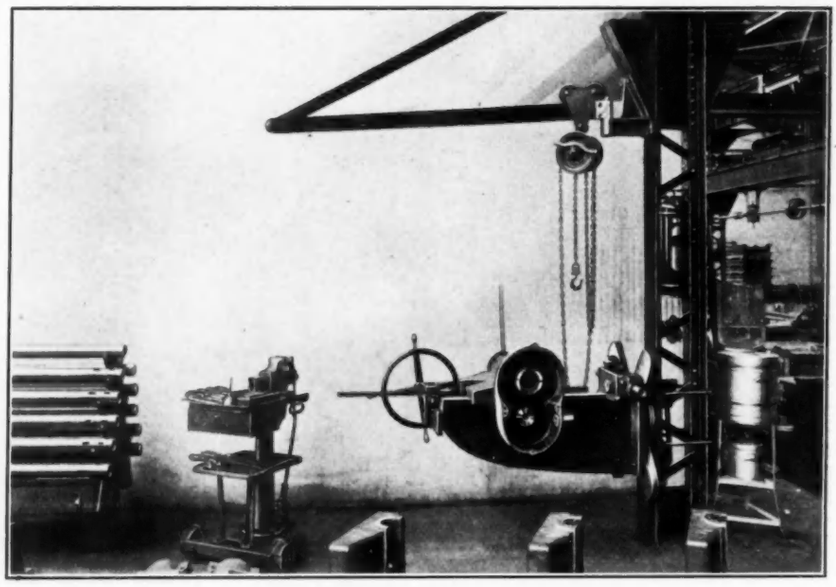


FIG. 5. SCRAPING IN THE HEAD

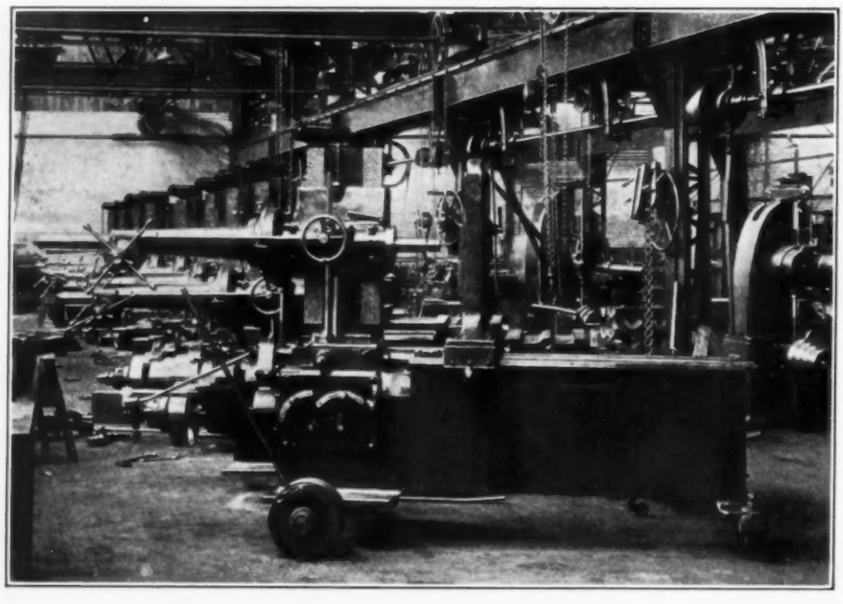


FIG. 4. MOVING THE MACHINES

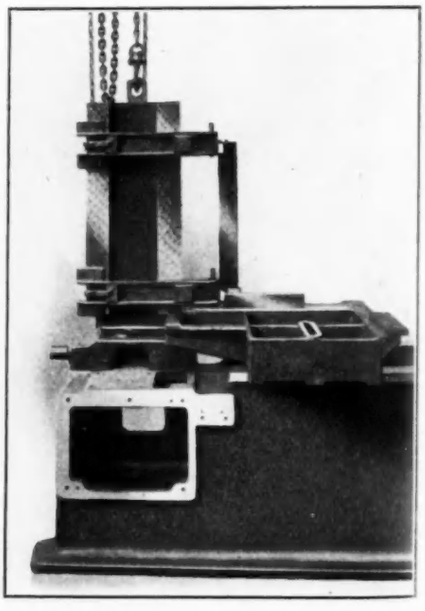


FIG. 6. SQUARING UP THE HEAD

easily moved back and forth across the bed. This bracket also contains a plunger which is normally held out by the spring shown and carries a wheel at its outer end which can be drawn in by the eccentric at the back. The platen is guided from its left edge as the gib goes on the right-hand side. The wheel in the end of the plunger holds the platen against its proper bearing edge at all times, and the long lever enables the workmen to move it back and forth on the saddle with comparatively little effort, so as to find its bearing without the aid of a helper. To still further assist in this work the platen is handled by the special lifter which is bolted at the end and allows it to be lifted after the long lever has been pulled out of its socket and the pin which connects the link from the socket to the corner of the table has been removed. With these out of the way it is an easy matter for the crane to pick up the platen and, once clear of the saddle, it can be rolled over inside the lifter on the trunnions on each end, so that the under side can be scraped where necessary and also allowing free access to the saddle itself.

Returning to the building itself Fig. 8 gives a cross-section showing details of construction of the saw teeth and roofing of the newer type. It shows the book tiles and their supports, the location of crane runways, the heating pipes and other features which will be of interest.

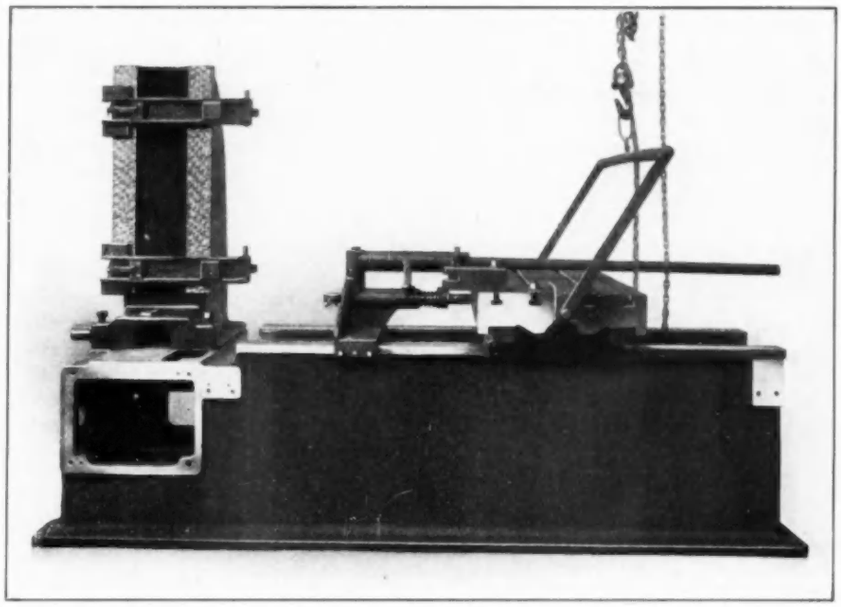


FIG. 7. SCRAPING IN THE PLATEN

Fig. 9 shows how the countershafts are supported on Z-bars. The Z-bars are clamped to the bottom of the roof trusses and can therefore be put up in any desired position without drilling holes. The hanger is also clamped to the Z-bars and therefore can be slid along to any desired position and can be placed directly under the truss if desired. We have not seen any method illustrated where this could be done and it is often a great advantage to be able to get the hanger in the exact position wanted.

The slotted brackets for shipper pole is a very successful attempt to solve the problem of a universal fulcrum which will be applicable to any position in which it is desired to put the pole, also to vary the

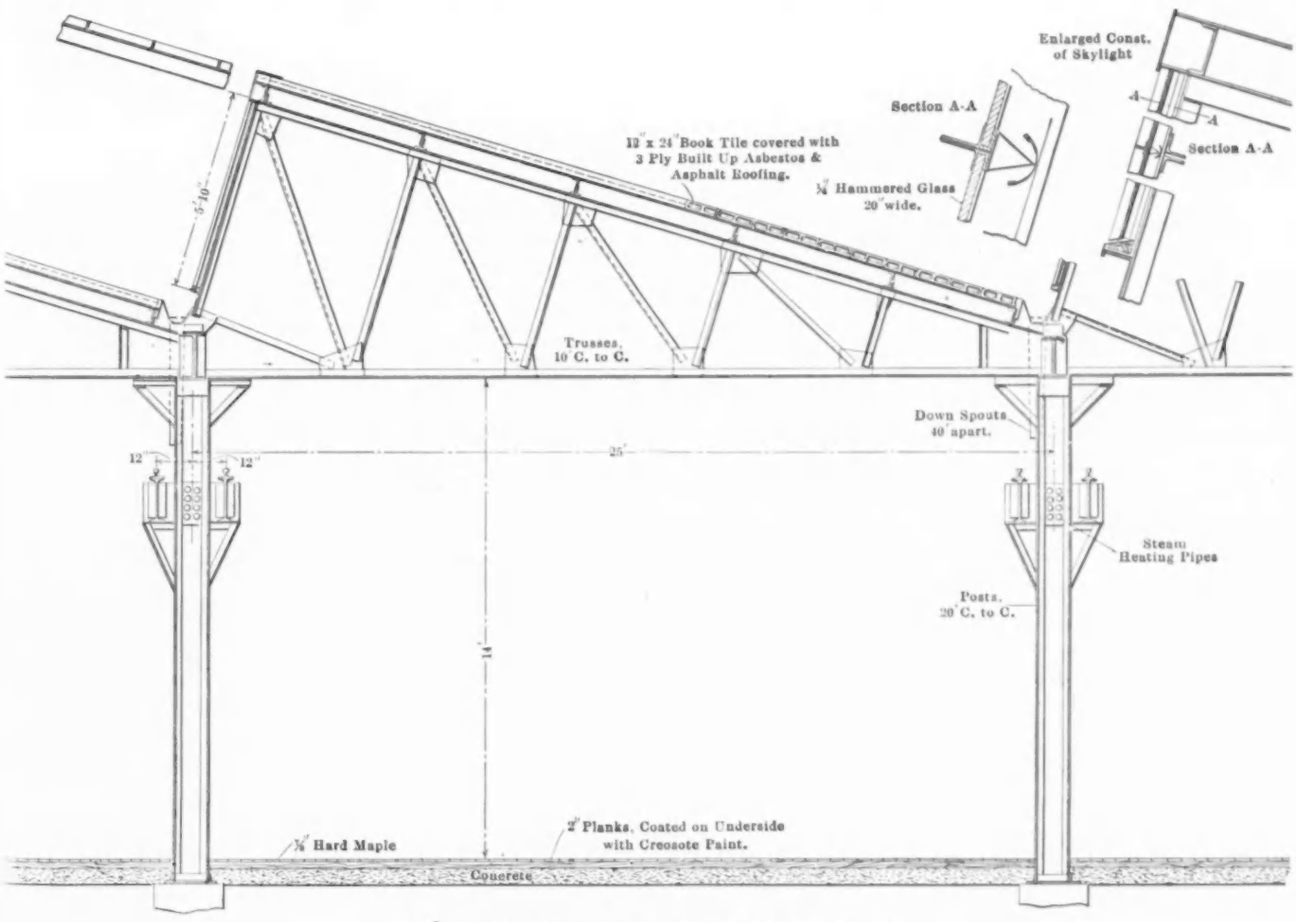


FIG. 8. CONSTRUCTION OF THE ROOFING OVER EACH BAY

length of the distance from *A* to *B* to give the lower end of the pole the right amount of movement.

Figs. 10 to 14 show various sizes of stepped blocks which seem to avoid the accumulation of lumber piles around the machines. Having one step a half inch nearer the plain edge than the other, gives steps of ½-inch intervals with surfaces 1 inch wide. The three larger sizes were made first and it was thought these would cover every case, but after these were provided, there was still an accumulation of scrap around the machines and the two smaller sizes were then made which seemed finally to cover the case. The smallest block they feel rather proud of because of its usefulness, as it covers every size from 1 to 2 inches by ¼ inch intervals, and costing almost nothing, can therefore be very liberally supplied.

The plug-hole covers for planer tables, Fig. 15, save lots of time cleaning out the holes. It is made of steel in the screw machine and every blind hole in the table is filled with a plug, the plugs being removed only when the hole is needed. These are lifted out by means of a horseshoe magnet, the hole on the under side of the plug being put in to make it light.

The T-slot finishing tool is self-explanatory. The round cutter is made of the same diameter as the slot to be finished and has the necessary clearance. When it is dull or worn undersize at one point, it can be turned slightly and new cutting edges will be presented to the work. Its construction can readily be seen from the illustration. See Fig. 16.

The boring-machine spindles are made of unannealed hammered-crucible steel and are as hard as can be worked, it being necessary to do all the operations with high-speed steel as the spindles are too hard to be worked at all with carbon-steel tools. The spindles are forged and rough-turned at least six months before they are finished, and in some cases more time is allowed for them to season. If a spindle forging is bowed or sprung so it will not quite true up, it is never straightened cold as it has been found that if bent to make it true up, it is impossible to get a true spindle as it will change after every operation and it is impossible to even grind it true.

The spindles are ground after all other work has been done, such as the key and drift slots and keyseat, and are allowed to season and are rough-ground within 0.001 inch of the correct diameter and are then finish-ground so they will just enter the sleeves and are a ringing fit. They are then worked in with crocus and oil. One of the split bushings for working them down to the limit is shown in Fig. 4, fastened to the column near the center of the picture.

These spindles must be ground round, parallel and must also run true which is a combination not often met with and more difficult to do than would appear at first and requires considerable experience. The taper center holes are ground out after all other operations are finished. The least deviation from parallelism and round will show very plainly after the spindle has been worked into its sleeve, and true spindles are a hobby with Mr. Lucas.

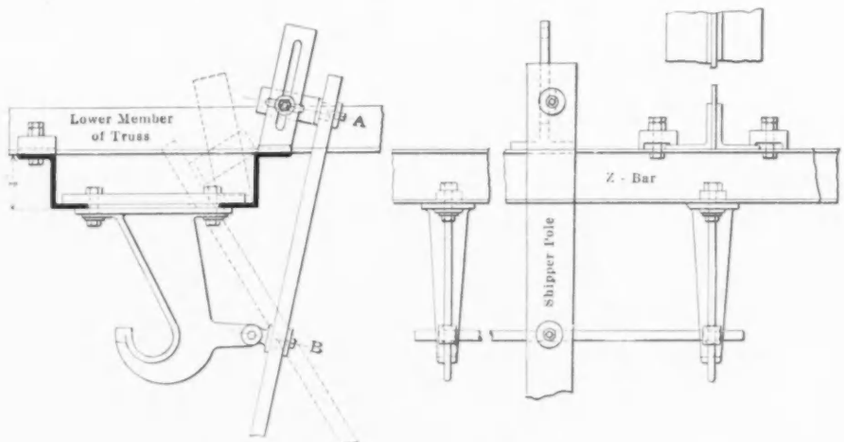


FIG. 9. CLAMPING HANGERS TO ROOF GIRDERS

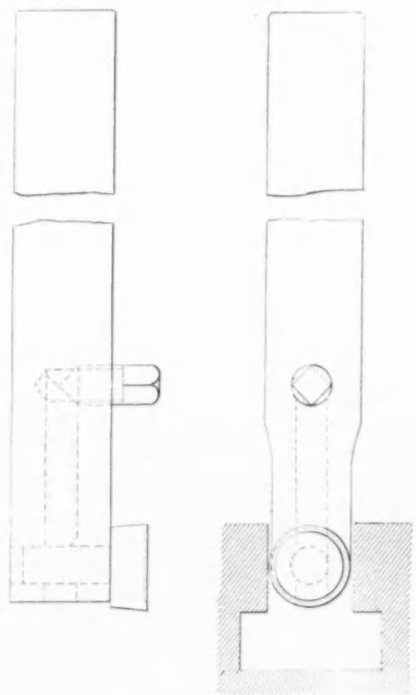
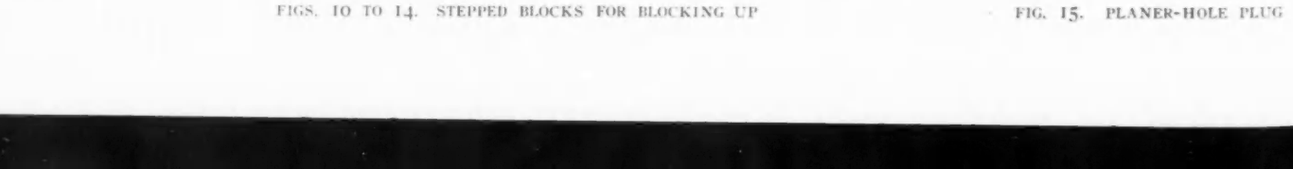


FIG. 16. T-SLOT SIZING TOOL

Steel belting for the transmission of power is reported to have some advantages from tests made by a firm in Charlottenburg, Germany. It is claimed that in view of its solidity a narrower band can be used and as a result it can be very tightly adjusted. A unique contact is said to greatly reduce slipping, and it is further claimed that owing to its lightness the influence of centrifugal force is not so great and therefore permits increased velocity.



FIGS. 10 TO 14. STEPPED BLOCKS FOR BLOCKING UP

FIG. 15. PLANER-HOLE PLUG

A Rotary Twin Planer and Its Work

Floor Plate Foundation with Screws for Adjusting Space between Planers, Size and Kind of Work Handled, Size of Chips Taken, Etc.

BY CLAUDE AIKENS

The huge rotary twin planer shown in the accompanying illustrations was built by Bement, Miles & Co., of Philadelphia, Penn., for the new works of the Allis-Chalmers Company which is located in West Allis, a suburb of Milwaukee, Wis.

This twin planer is in reality two separate and distinct machines which are built right and left hand so that they may be used on the two sides of a casting at the same time, but they can also be used on separate pieces of work when desired, as each machine is run by its own motor. These motors are mounted on the saddles of the machines as shown a little to one side and above the heads of the operators in Fig. 1. They are each 40 horse-power and drive the machine through gearing having 3-inch pitch and 8-inch face. These gears are arranged in such a manner as to provide three different cutting speeds to the machine, namely, 22, 30 and 40 feet per minute.

The saddles have bearings 10 feet long on their beds, the beds being approximately 26 feet long, which gives a saddle traverse of 16 feet. Tables are provided on the saddles, for the operators, which are 6 feet long, 30 inches wide and 18 inches above the saddle bearing or ways. Three feeds are provided the saddles by gears, the maximum of which is 8 inches of travel on the bed or ways, per minute.

The front bearing of the spindle is 24 inches in diameter and 24 inches long and the rear bearing is 18 by 18 inches. From the floor plate to the center of the spindle and cutter head is 6 feet. A quick power movement is provided for both cutter heads, with shoes for the thrust of each head.

The Cutters

The cutter-head faces which are the most clearly shown in Figs. 2 and 3 are each supplied with 94 high-speed steel tools 1 inch by 2 inches at the base. Each one of these is held securely in position by two bolts which screw through a steel ring that has been shrunk on the cutter heads. These tools can be easily changed for those having a larger or smaller cutting edge to suit the requirements of the work.

The cutter heads are 10 feet in diameter and when one considers with this the fact that the saddle has a travel of 16 feet on the bed of the machine, the large size of the work which the machine is capable of planing on both sides at the same time can easily be figured.

A roughing cut 1¼ inches in depth can be taken from cast iron at a saddle travel 1½ inches per minute, and a finishing cut 1/32 of an inch deep at a travel of 4 inches per minute with a rotative speed, at the periphery of the cutters, of 175 feet per minute.

Floor Plate

The floor plate on which these machines rest is one of the special features of the West Allis works. It is 24 feet wide and extends the entire length of the shop, which is nearly a quarter of a mile long, except for a few breaks as shown in Fig. 2 to allow the industrial railway to pass from one side to the other.

The floor plates are provided with tee slots so that the work and machines can be bolted to them and they are laid on a concrete foundation of a sufficient depth to insure a permanently flat and level surface.

All of the larger machines, such as boring mills, radial drills, planers, etc., are located on this plate, thus doing away with special plates for each machine. Many of the machines have eye bolts cast or fastened to them, similar to those shown on the sides of the bed of these rotary planers, so that they may be easily moved from one part of the floor plate to another by the large overhead traveling cranes with which these works are liberally equipped.

The rotary planers shown here are set face to face on this floor plate. A right- and left-hand screw is fastened to each side of the floor plate as shown on the front side in Fig. 2. In this view it is shown covered with sheet metal to prevent the chips from getting in the threads of the screw. These screws have a bevel gear on the ends which are in mesh with other bevel gears on the ends of a shaft running across the floor plate, one end of which is shown in Fig. 2 with its gear.

The planers are fastened to the screws

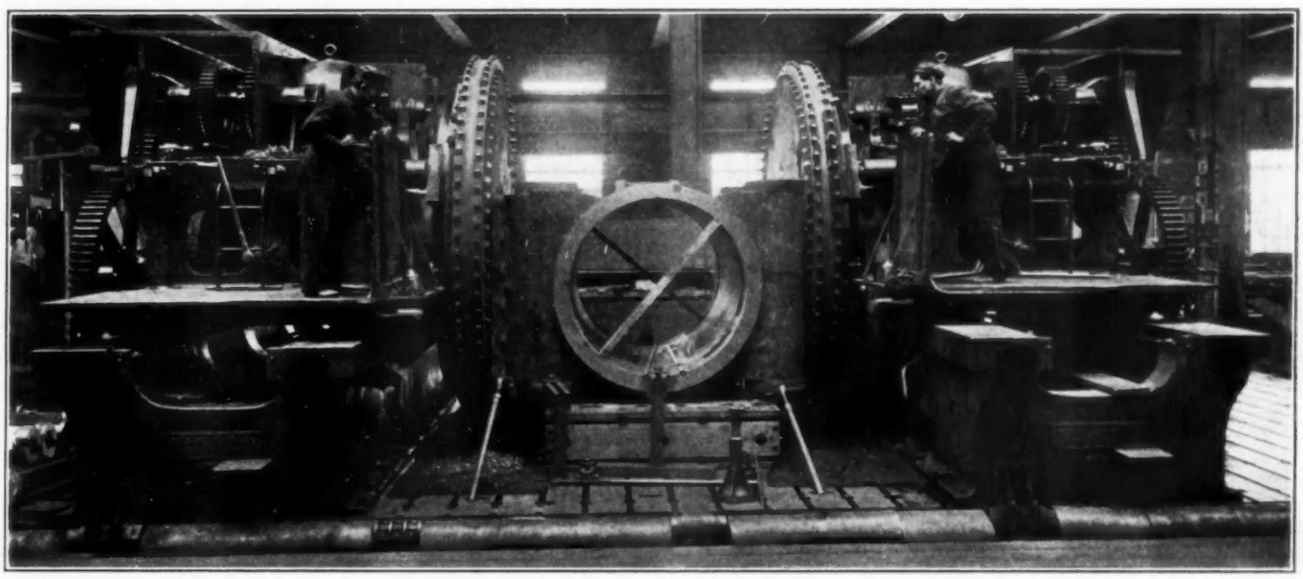


FIG. 1. TWIN ROTARY PLANER OF THE ALLIS-CHALMERS COMPANY

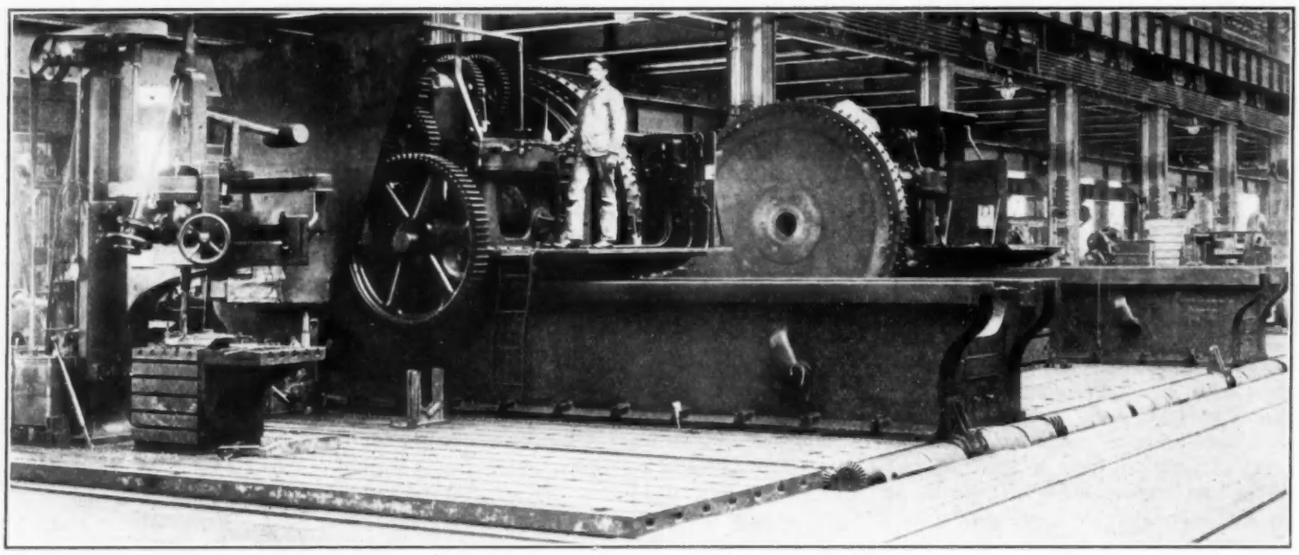


FIG. 2. SHOWING METHOD OF ADJUSTING THE SPACE BETWEEN PLANERS

by clamp nuts, which are shown on the end of the bed at its base. A motor turns the cross-shaft which moves the screws on both sides of the floor plate, simultaneously, through the bevel gears. This opens or closes the gap between the planers to fit the work which is to be planed and the machine is always kept parallel to the one opposite it. Usually but one machine is moved on the floor plate and the other is disconnected from the screw by unbolting the clamp nuts as shown in Fig. 2.

Grouping of Machines

With this arrangement of floor plate any portable machines desired may be grouped around the work and drilling, slotting, key seating, grinding, etc., may be done at the same time that it is being planed, or where the casting is a large one, time may be saved by doing away with resetting and clamping the work. In other words when the casting or work has been squared with the floor plate and clamped to it, it may be machined in a number of different ways before being removed from its position on the floor plate. In many cases all of the machine work may be done on a piece with the one setting.

These machines are planed smooth on the bottom and parallel with the saddle bearings or ways so that they will run true and move easily on the floor plate. This necessarily has to be done with all machines which are used on this floor. Some of the machines have tongues and grooves on the bottom to guide them in their movement on the plate, or to square them up with the floor plate and consequently the work.

This planer is one of the heaviest portable tools which has been made and ordinarily it has to be moved only a few inches, but with the eyes cast in the side of the bed it is not a difficult matter to move it a considerable distance with the traveling cranes which are overhead.

The Work

Some of the largest pieces which enter into the construction of the engines and machines which the Allis-Chalmers Com-

FIG. 3. WORKING WITH ONE PLANER ONLY ON A GAS ENGINE CYLINDER

pany build are machined on these planers. It has been used to face, with a roughing and finishing cut, both sides of their 105-ton gas-engine frame and the 96-inch cylinder of the blowing engine which was made for the Carnegie Steel Company was machined on it as shown in Fig. 4. This is the largest gas engine which has been built up to the present time.

One of the most important uses to which it is put is the simultaneous machining of a number of parts, identical in character, which need to be exactly matched in size. A good example of this is the twelve halves of the six A-frames which are used to support one of the Allis-Chalmers Company's vertical triple-expansion pumping engines. These are clamped together in pairs one above the other and the pairs clamped to the floor plate in a row. They are then finished on both ends in one operation, thereby insuring absolute accuracy of alinement so far as the machining is concerned and it makes them interchangeable. One of the rules laid down by this company is to make all parts on their different products interchangeable so that repairs can be easily made.

Both of the planers constituting this twin machine are operated by one man, with a helper, and either can be run independently of the other, when desired, on two different classes of work.

Conclusions

The advantages which this style of planer has over the ordinary planer are seen in the large pieces of work which can be machined with a comparatively small planer; in the number of cutters which can be brought into operation at one time and in the saving effected by abolishing the return stroke.

This style of planer in large units was first used in the manufacture of armor plate, two circular cutter heads being used to plane the edges of the armor plates so they would be the correct size and give a straight, flat surface to fit the next plate to. When the armor plates are too wide a cutter head, similar to that shown on these planers, is used to plane one edge of the plate and a saw with inserted teeth of high-speed steel is used to cut the other edge so it will be the proper width.

Where 2 or more inches of stock has to be removed from both edges of the armor plate owing to its having a very uneven edge from the operations it goes through of rolling, forging and bending, two saws have been used on the twin planers. The only difference between the cutter heads, shown in these illustrations, and the saws being that the saws have the cutting tools inserted in the outside circumference of the cutter head which is made much thinner than those shown to allow it to pass through the slot cut by the saw teeth.

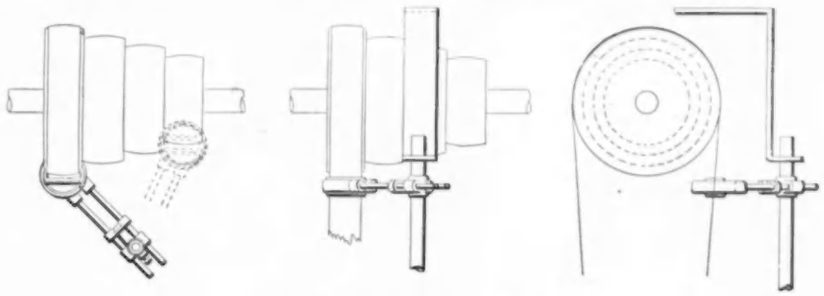
In the machining of armor plate a metal is met with that is about as hard to machine as any steel that is cut with cutting tools; yet with this style of machine cutting tools have been used in the cutter heads with a width of 4 inches on the cutting edge and the speed at which the work is turned out is greater than that obtained with any other style of machine.

That the machines are enabled to cut metals as hard as armor plate in an economical way is almost entirely due to the fact that the best grade of high-speed steel obtainable is used to make the cutting tools of.

A Unique German Belt Shifter

By Frank C. Perkins

One of the most annoying operations in machine-shop practice is the changing of belts on countershafts, lathes, and other machine tools requiring cone pulleys for obtaining the various changes of speed.



UNIQUE GERMAN BELT-SHIFTING DEVICE

The accompanying drawings show the construction and method of operation of a belt shifter of German design which is of special interest. It may be stated that the Bamag belt shifter for cone pulley weighs about 2¼ pounds for belts from 1 to 2 inches wide, up to 13¼ pounds for larger belt shifters for belts of 4 to 5 inches in width. These are built at Dessau, Germany, by the Berlin-Anhaltische Maschinenbau-Actien Gesellschaft.

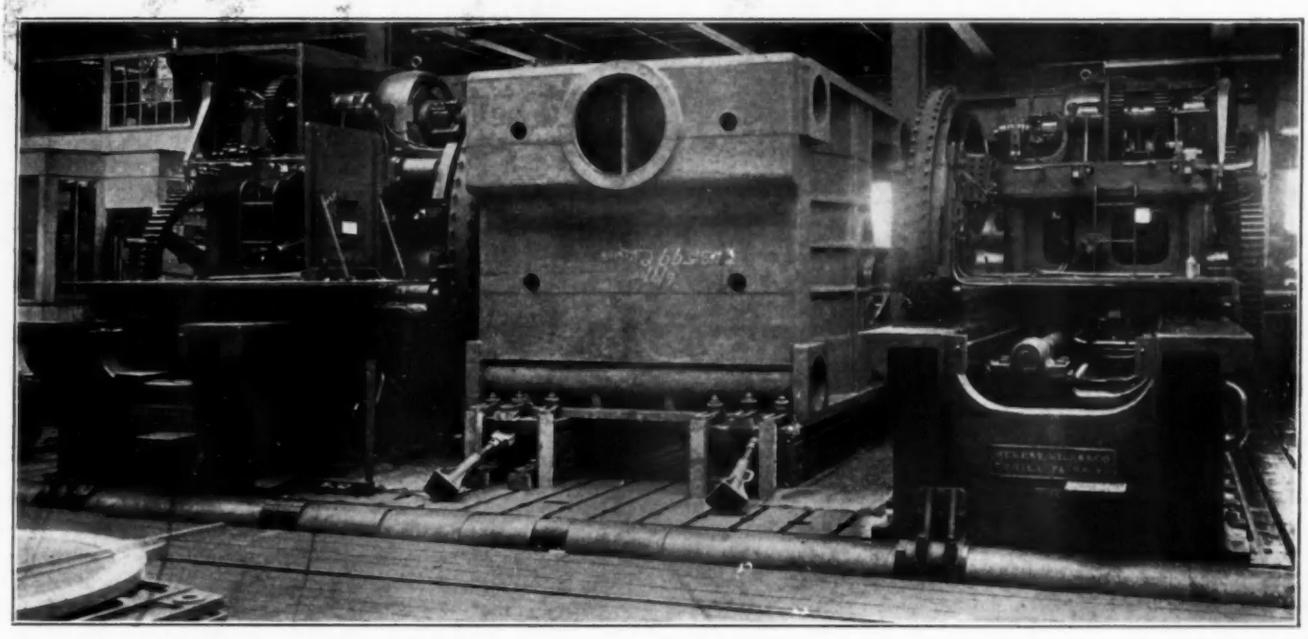


FIG. 4. MACHINING BOTH SIDES OF THE 96-INCH CYLINDER FOR THE CARNEGIE STEEL COMPANY'S GAS ENGINE

Making Core Boxes by Machinery

A Machine Which Handles a Large Variety of Shapes and Sizes, Enables Poor Stock to Be Used and Is a Great Time Saver

EDITORIAL CORRESPONDENCE

The making of core boxes has in most cases been entirely a hand job, and with the exception of plain straight, round cores, machinery has for the most part been considered out of the question, and even here there has been very little used. While the machine shown very closely resembles a number of other wood-working machines in general appearance, it is quite different from any of them except, perhaps, that the cutter head revolves in much the same way as the buzz planer. The machine has a perfectly flat-top table with the exception of the guides, which are adjustable in the slide shown, and the cutter head, which comes up above the table when cutting core boxes.

The knives consist of round steel shanks with the cutting edge forged to the right shape, and these are set so as to cut the correct diameter by the gage, shown in Fig. 1, which also shows the method of holding, and the cutter head in general. Having set the cutters to the correct diameter, all that is necessary is to feed the stock to be cut over the cutter in such a way as to produce the desired shape, the contour always being the arc of a circle, and when the core box is completed this becomes a half circle. The cutter head is adjustable by the hand wheel shown under the table in Fig. 2, so that any desired depth of cut can be taken, and it only becomes necessary to guide the stock in the desired direction to produce any round core box that may be wanted, almost without regard to their shape.

In Fig. 2 a fairly large quarter-turned core box is being finished, the stock being laid out to the desired curve on the outside and cut out by a band saw, so that it only becomes necessary to guide this between the two vertical rolls, and after a few cuts, which, of course, depend entirely

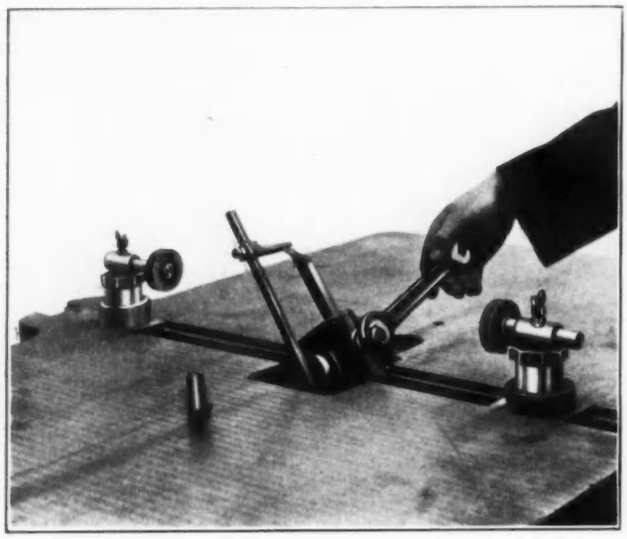


FIG. 1. SETTING THE CUTTERS

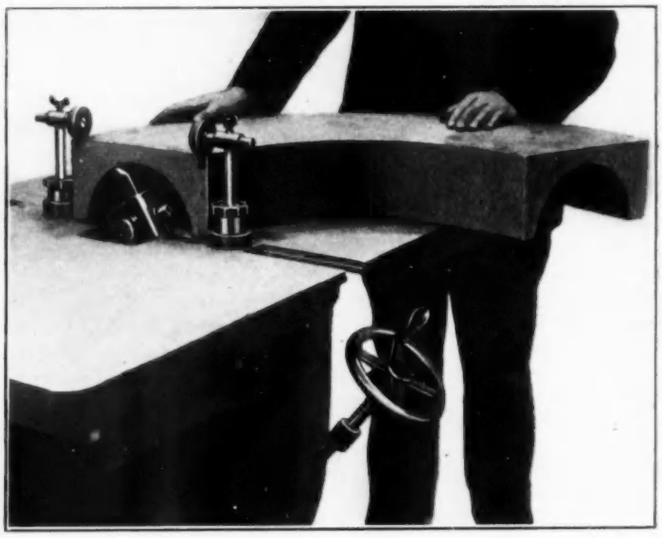


FIG. 2. MAKING A LARGE QUARTER-TURN CORE BOX

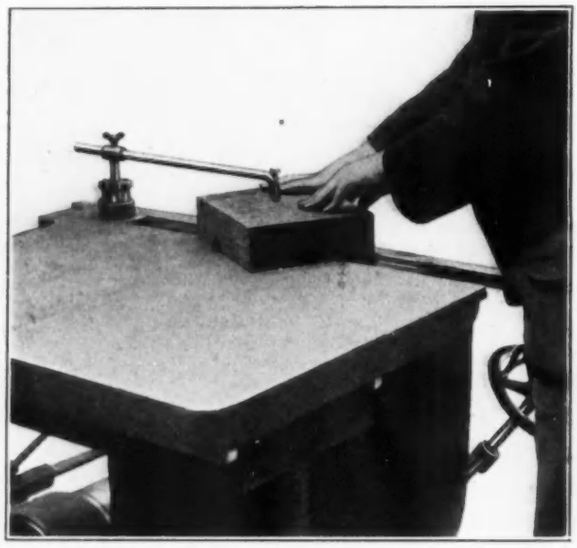


FIG. 3. CUTTING OUT A HEMISPHERE

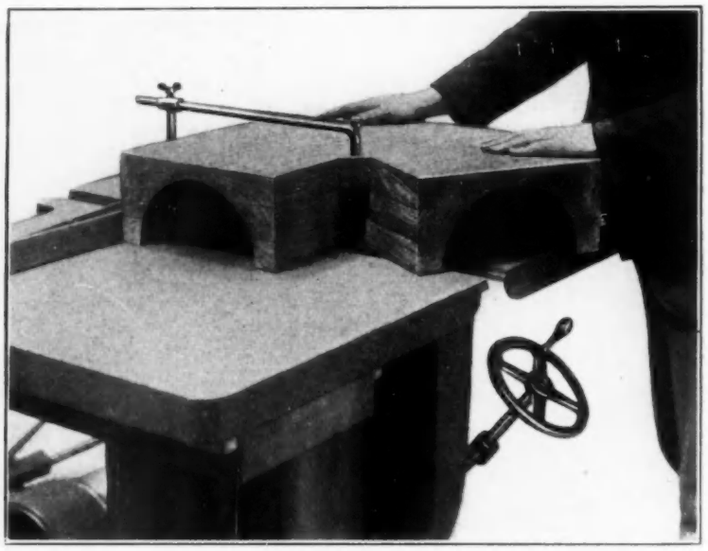


FIG. 4. AN ACUTE ANGLE BEND

on the stock to be removed, the core box is completed and has the advantage over the hand work of being perfectly true and also very smooth. No measurements are necessary after the cutters are once set, as there is a stop which prevents the cutter head being fed up beyond the point where the center of its shaft is in line with the top of the table, so as to produce a true half circle in every case.

Guiding the Work

The guide wheels on the vertical shafts are about ½ inch thick, one of them being of iron and the other of rubber. In passing the blank stock over the top of the revolving cutter one edge is kept constantly against the iron roller guide and the other against the rubber wheel, and it is evident that the core box cut will be exactly parallel to the edge which goes against the iron guide.

The top guides are used, as shown in Figs. 3, 4 and 5, the first case being used as the center of a circle. This is an acute-angle bend and the straight parts of the core are obtained by use of the angle guide at the back, while the overhead guide shown reaches to the center of the curve of the bend. All that is necessary is to swing the core box around this pivot, and when the other side comes against the angle plate the overhead guide is removed and the straight part finished.

In Fig. 3 the core box has a ball in the center under the point of the overhead guide shown, and after using the angle guide for the straight part of the core, the core box is simply revolved around the point of the overhead guide and the ball cut out in a very short time.

guide adjusted so as to bring the edge of this form directly over the center of the cutter spindle. With this guide in position it is then comparatively easy to feed the blank over the cutter in practically the same way as for straight work, except that the blank must be guided by the form on the back, instead of by the outside edge. This is shown in Fig. 5, where the return trap, shown at the top of the pile of core boxes in Fig. 6, is being cut.

Figs. 6 and 7 show a variety of core boxes, and by comparing them with the hight of the man it is easy to see that this machine will handle about every size of round core box that is used in the average shop.

It is, of course, possible to produce core boxes of other cross sections than semi-circular, such as the arm of flywheels, provided they are any part of a circle that can be cut on this machine, and as these handle anything up to 24 inches in diameter they have a fairly wide range. They can also cut square, flat-bottomed grooves that cross pieces at any angle, and a large variety of work that will suggest itself to any patternmaker who has a machine of this kind under his care.

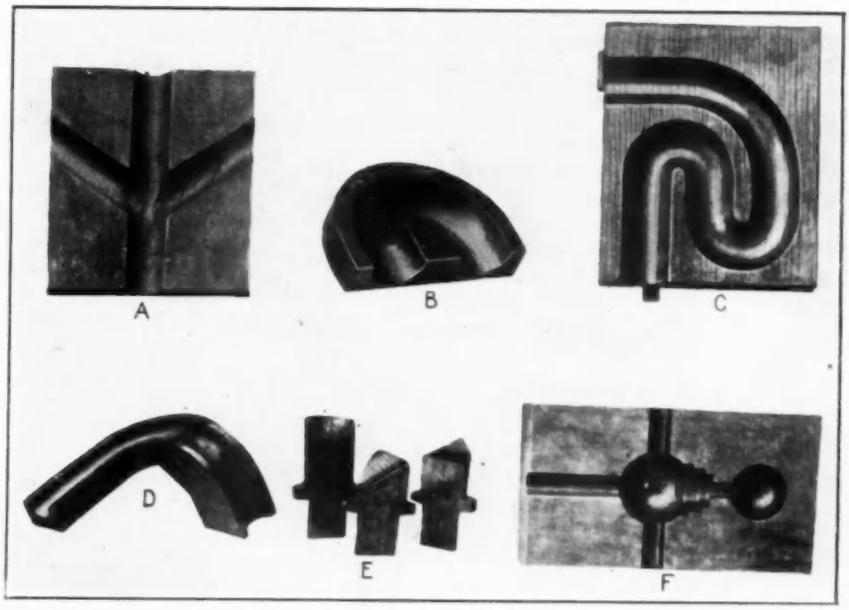


FIG. 7. CORE BOXES MADE IN RECORD TIME

The Time Required

As an idea of the rapidity with which work can be turned out, we give the time on a few of the pieces shown in Fig. 7. Box *A*, which, as will be seen, had a bad knot right at the junction of the arms, and contains 22 inches of 1½-inch core, was finished complete in 17 minutes. *B* is a semi-circular half-round core with straight extensions, and is 2½ inches in diameter; the length of the cut is 13 inches, and the time was 15 minutes. The semi-circular trap core box *C* has a diam-

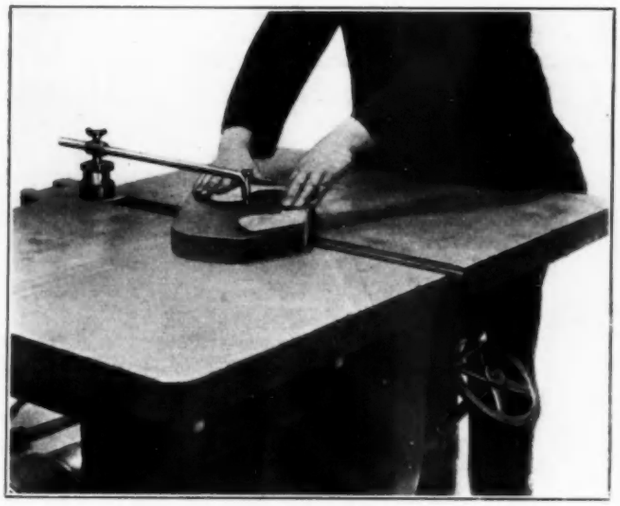


FIG. 5. FORMER USED FOR TRAP CORE BOX

FIG. 6. SOME OF THE CORE BOXES MADE

Making Special Shapes

In the making of special shapes and irregular work such as the trap core, shown in Fig. 7, the simplest way is to bandsaw a form of thin stock of such a shape as will represent the center line of the core box to be cut. This is tacked on the back of the blank stock and the overhead

eter of 2 inches, and the length of the cut is 31 inches. The time taken for this was 20 minutes. The semi-circular compound quarter-turned core box, shown at *D*, is 1½ inches in diameter, and the length of cut is 18 inches. The time was 14 minutes. At *E* are shown three bosses fitted for cylindrical or spherical surfaces, the diameter being 2½ inches, and the time required 4, 5 and 8 minutes, respectively. At *F* is a semi-circular and hemispherical core box cut in a block 8x14 inches. There are eight different diameters, varying from ¾ to 3½ inches, and the entire core box was cut in 60 minutes.

One of the advantages is that it enables knotty and otherwise poor lumber to be used up in core boxes, which is hardly possible when they are made by hand, and is a considerable item in core-box expense. This core-box machine is made by the Fox Machine Company, Grand Rapids, Mich.

English High-speed Cold Saws

By J. W. Chubb

Several styles of cold saws of the type in which the cutting disk travels to the work which is fastened down to a fixed table are produced by the firm of Roberts Brothers, Dukinfield, Manchester, England. The feed may be either mechanical or pneumatic. Figs. 1 and 2 show a machine of the former style, however, without the driving motors. The guaranteed capacity of the machine is 7½x7½-inch angles or 24x7½-inch beams. Its weight is about 12 tons. Two 40 horse-power electric motors are mounted on an adjustable plate carried by the body of the machine, and extended backward so as to give a suitable length of drive for the belts to the saw spindle at the front. Reference to Fig. 3 will show that the two motors are mechanically coupled pulleys carried between bearings on one side of the saw. The motors run at 800 revolutions per minute to a central 27-inch pulley driving a 12-inch. The pulley, therefore, runs at about 1800 revolutions per minute.

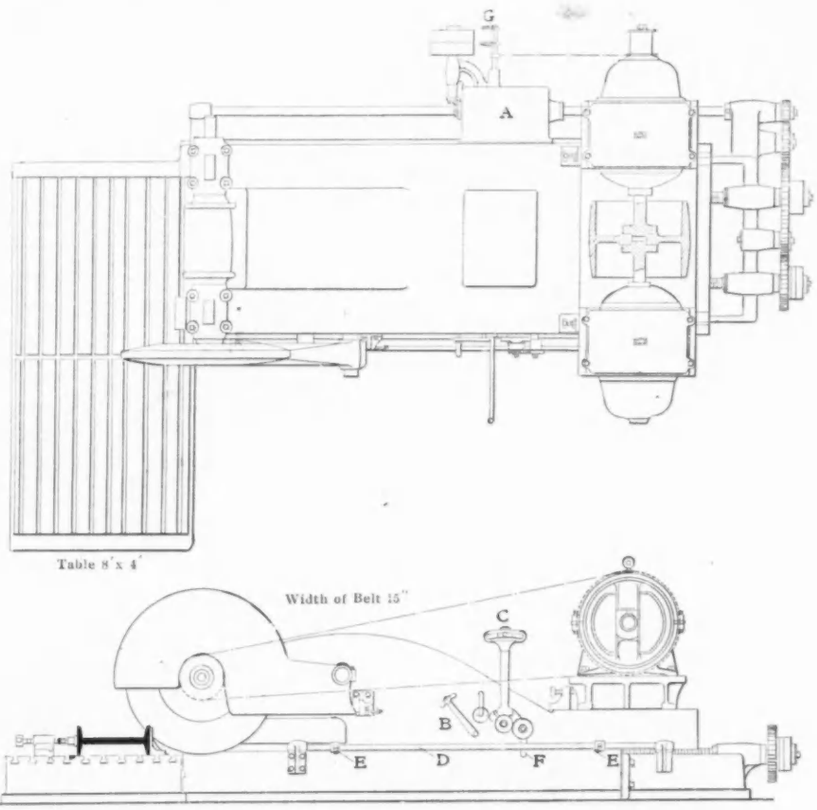


FIG. 3. GENERAL DETAILS OF A LARGE ENGLISH HIGH-SPEED COLD SAW

The cutting disk is of mild steel 3 feet 6 inches in diameter and has back and front supporting plates of steel which are made as large as the work will permit, in this case 2 feet in diameter. Light guards protect the gearing; the form of the cast-iron shield for the saw is plainly shown. The bed on which the body travels is 10 feet long; the longitudinal movement of the saw head is 3 feet 4 inches. The table for the work is fastened to the front of the bed and measures 8 feet by 4 feet. The top is provided with the necessary slots for securing the work.

The saw spindle is of special 0.35 to 0.40 carbon steel, 3 inches in diameter, in the journals, which are 15 inches long over all and run in Magnolia metal. The bearings are of the firm's ring lubrication type; the rings throw the oil into a distributing chamber at the top whence it is carried down curved surfaces to three holes at different positions along the bearing. For the mechanical feed power is transmitted by belt from the motor spindle to two feed pulleys which give different rates of feed; namely, 6 inches and 12 inches per minute, with a quick return at 4 feet per minute.

The change in rates of feed is effected by a sliding clutch in the gear box *A*, Fig. 3. The clutch is operated by a handle *B* carried through to the front side of the traveling head. The change from cutting feed to return is automatic, the position at which the change takes place is controlled by adjustable stops *E* on the shaft *D* at the front of the bed. From the feed pulleys motion is carried through gearing to large square-threaded screws inside the bed; ample provision is made for lubricating these screws, which

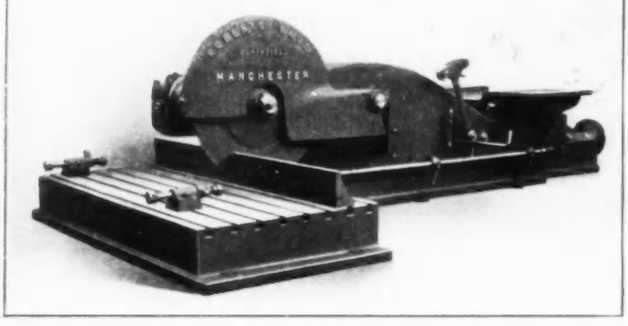


FIG. 1

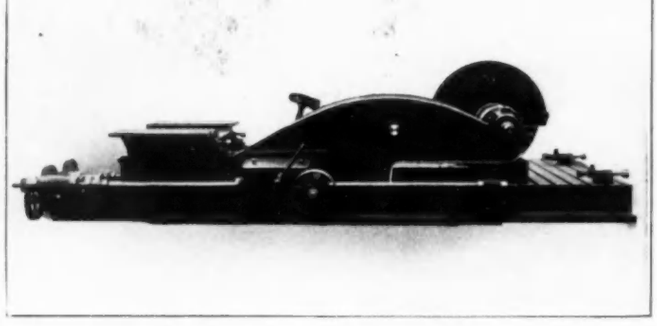


FIG. 2

A LARGE ENGLISH HIGH-SPEED COLD SAW

are fitted with ball-thrust collars to secure smooth working. For reversing from cutting to return stroke the lever *C* is used. A stop on the front rod catches a finger at *F* which throws over the lever, and this in turn throws across a clutch in the gear box. At the end of the feed screws an arrangement is provided by which the weight of the feed is kept off the gear box for a sufficient length of time to enable the weight *C* to roll over and carry the clutches properly into the gear. Rod *G* simply shuts off the feed.

As regards the pneumatic feed it is not automatic; it is controlled entirely by hand. Fig. 4 shows the system. At the front will be seen a lever which controls the valves. When this is in position at right angles with the traverse of the saw disk the valves are shut both to supply and exhaust. If the lever is brought forward, the back valve is open to supply and the front valve to exhaust and when the lever is thrown toward the back of the machine, the action is reversed. Each

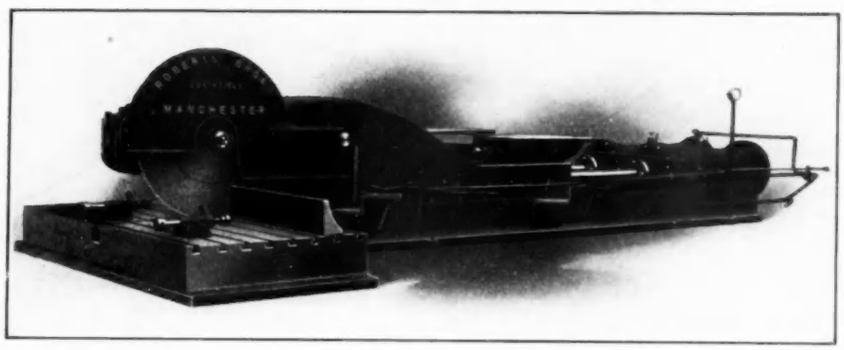


FIG. 4. ENGLISH COLD SAW WITH PNEUMATIC FEED

valve is connected to both cylinders. In the machine illustrated the pressure used is 80 pounds to the square inch.

Last year Germany exported 552 large-size locomotives, 395 smaller ones up to 10 tons each, 71 locomotive tenders, and 3604 tons of locomotive parts. The total value of all was about $8,568,000. Italy was the principal customer for German locomotives, large shipments being also made to France, Chile, Argentina, and Brazil. Other customers were Spain, Turkey, Siam, Switzerland and Roumania.

The world's production of lead in 1907 was about 992,800 tons, an increase of 2 1/5 per cent. over that of the year 1906. The largest share in this increase was that of Mexico, whose output of the metal advanced from 54,000 tons in 1906 to 72,000 tons in 1907. The United States produced 340,700; Spain, 185,800, and Germany, 140,000 tons. The principal lead consumers in 1907 were United States, 351,400; Great Britain, 188,000; Germany, 187,000; France, 81,100, and Belgium, 31,500 tons.

Bluing Tool Handles

By F. Webster

It is customary to blue the handles of the different kinds of pliers for pipe and wire work, not only to give them a good appearance, but also to prevent them from rusting. The coloring can be done by the heat-treatment method if care be taken to prevent the temper from being drawn in the jaws and blades of the pliers.

The bath for heating the handles after the pliers have been hardened is composed of potassium nitrate, commonly called saltpeter, which is melted in a cast-iron pot or tank. About one-tenth part of pulverized black oxide of manganese is added and thoroughly stirred through the melted niter. In some cases half the potassium nitrate is replaced by sodium nitrate, as the latter is cheaper, and the combination bath seems to give very good results. In some cases a small amount of black oxide of iron; that is, magnetic iron ore, has been added to the melted potassium bath.

The chief secret in the use of any bluing bath is to insure heating the hardened steel to the proper temperature, and at the same time have it coated so as to prevent contact with the air. It is best to arrange the furnace for the use of gas or oil burners for heating the bath, as the temperature can be more easily controlled by this method than by heating with charcoal or coke. The proper temperature of the bath can be determined in a practical way by throwing some dry sawdust on top of the molten mass. The sawdust will burn rapidly when the temperature is up to 600 degrees Fahrenheit, which is about right for giving a blue color to hardened steel. Generally the work would not become as hot as the bath.

A grid or frame should be arranged for holding a number of the pliers for treatment at one time. By placing the grid across the top of the tank, the handles of the pliers would be immersed in a vertical position to the proper depth. Ordinarily, from three to five minutes' immersion, depending upon the size of the work, will be sufficient to give the work a deep blue color, and at the same time leave the jaws or cutters a straw color at the base, gradually shading to full hardness at the point of the tool. By lifting the grid, the entire bunch of twelve or more tools can be removed at once, and then immersed in boiling water to wash off the adhering niter, after which the contained heat will quickly dry the work. When completely dried, immerse the warm pliers in a composition oil bath made up of the following proportions:

Kerosene, 10 gallons; engine oil, 2 gallons, and boiled linseed oil, 1 gallon. Work that has received this bluing treatment will not be greasy to handle, and it will look well and not rust.

How I Use the Advertising Pages

By Alfred Prince

Seeing so many of your readers writing about the advertising matter in the American Machinist, I follow their good example.

When I send a half volume to be bound I do not send the numbers complete, but only the magazine proper. I take off all the advertising matter by opening the wire fasteners with a pair of pliers. I then take the advertisement of the Cincinnati Milling Machine Company with examples of some kind of milling, size of cutters used, table travel, feed, etc., and paste it in an old ledger under the index of milling practice, along with any other on the same subject, as for instance, the Van Norman, Newton, Becker-Brainard. Then I take and cut out the Cleveland Automatic Machine advertisement. I tried to see if the numbers of pieces made ran consecutively, so as to put them in rotation, but I found that the numbers were duplicated on different pieces. So I paste them in as I find them with turret-lathe work. There is not enough variety in these advertisements, as I find that Potter & Johnston have been machining automobiling gas-engine wheels this long time. I notice that I have only one advertisement of Niles-Bement-Pond, but this occupies two pages.

I then cut out all the advertisements relating to cutter grinding of the Cincinnati Milling Company, and of the Landis and Norton Company's grinding machines. Afterward I go through the advertisements for novelties in tools. I notice that I have pasted in N. U. Walkers, crane pullers; Remington Tool Company, spring winders; Grönkvist Chuck Company, gages; Cincinnati Machine Tool Company, drill-press chuck; Hisey-Wolf Company, internal grinder and so on.

As for this ledger, money would not buy it.

Practical Letters From Our Readers

A Round Table Discussing Details of Modern Machine-shop and Drawing-office Methods, Practice and Economy

WE PAY FOR USEFUL IDEAS

Belt Shifter

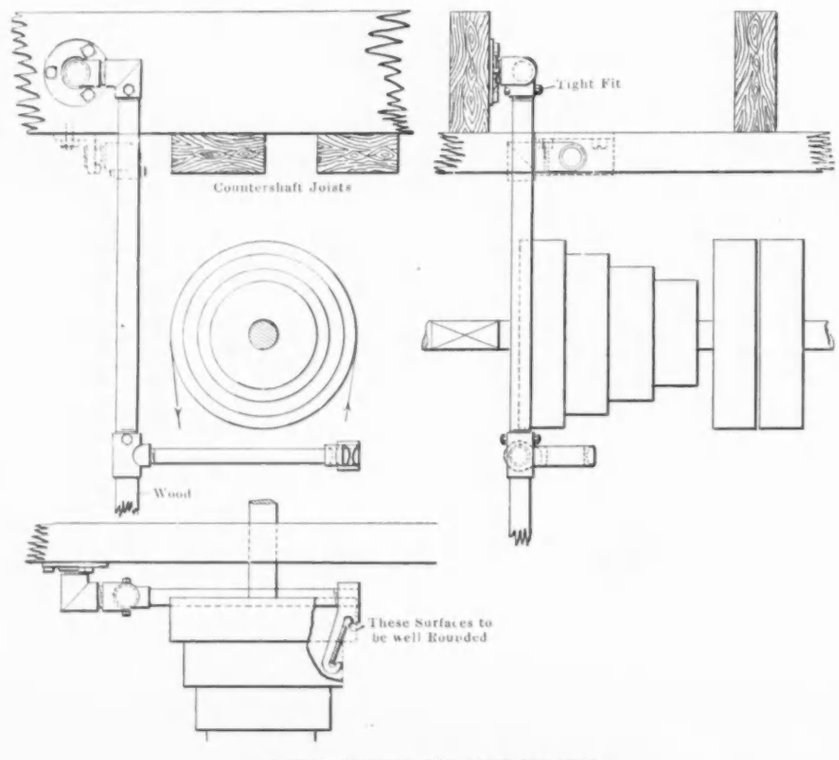
The accompanying illustration shows a belt shifter for high belts. The fixed portion of the belt shifter illustrated consists of an ordinary gas-pipe flange with a nipple screwed tightly into it, or in the case of the arrangement shown dotted (for fixing the device onto the underside of a beam) a piece of angle iron or bent plate is used with a tapped hole and nipple secured by a back nut.

The next three parts are: elbow, nipple and elbow; these allow the operating handle to move in any direction by the elbows turning through a few degrees on the nipples. The next part is a length of gas pipe cut to suit the countershaft, keeping the arm carrying the fork as near the cone pulley as possible. In order that the fork shall always move parallel with the tee piece this length of pipe is prevented from turning by a small bolt at each end. After another short length of smaller pipe comes the only special part, the cast-iron fork; this is made to approximately suit the width and thickness of the belt.

The belt tending to tighten the fork on the pipe the only fixing that is necessary is to tap the boss of the fork and screw "home" on the pipe. The wooden handle is securely held by forcing it into the thread of the T-piece. Provided the belt shifter is erected with moving joints stiff and fixed joints screwed tight, there will be none of the objectionable rattle so apparent in some belt shifters, also the fork will hang clear of the belt.

The cost is trifling as most of the parts can be found "lying around" the millwright's bench or taken from discarded piping.

Toronto, Canada. C. BENTALL.



A BELT SHIFTER FOR CONE PULLEYS

Jig for Drilling Spanner Holes in a Ring Nut

In Fig. 1, *a* is the body with the shank made to fit the tailspindle of the speed lathe; *b* is a double screw with three

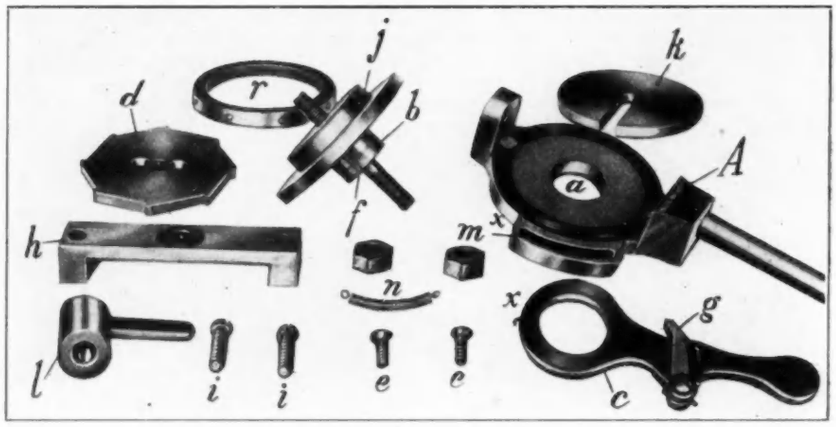


FIG. 1. THE JIG DISASSEMBLED

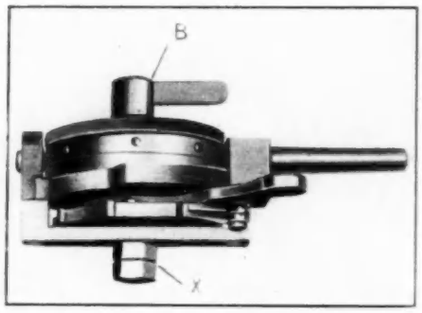


FIG. 2. JIG FOR DRILLING SPANNER HOLES IN NUTS

collars or disks on it, the smallest of the collars fitting into the hole in the center of the body *a*. The ratchet lever *c* is put on next and goes on the same collar but under the body. The ratchet *d* has eight teeth and three holes as shown. The center hole fits the stud. It is fastened by the screws *e e* to the part *b* at *f*. The pawl *g* on the ratchet lever is, of course, underneath the lever. The bridge piece *h* is fastened on to the body by the screws *i i*, and is a support to the body. The ring nut *R* to be drilled is placed on the collar *j* and is held

firmly down by the washer *k* and lever nut *l*. By moving the ratchet *c* from right to left as far as the slot *m* in the body allows you are in position for the first hole. The lever is brought back to the starting point by the little spiral spring *n* which is fastened at one end to the ratchet lever at *X* and the other end to body at *X*. A pin on the ratchet lever moves in the slot *m* to limit its movement. It will be understood that by moving the lever forward everything except the body and support *h* moves around ⅛ of a turn. The nut and check nut as shown at *X*, Fig. 2, are adjusted so as to hold the revolving stud and disks to the body at a uniform pressure.

J. E. ANDERSON.

Winchendon, Mass.

Eccentric-turning Attachment

While working in one of the shops where the suggestion system is used, a request came in from the tool room for an eccentric-turning attachment to be applied to the small bench lathes of Pratt & Whitney make. The attachment had to take in 6 inches in length and have a throw of ¼ inch and to use the regular collets.

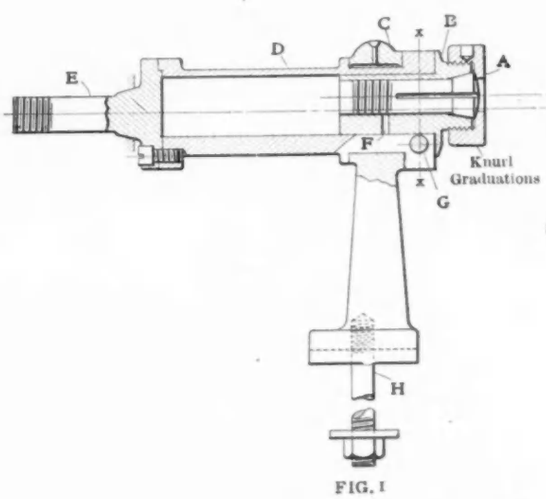


FIG. 1

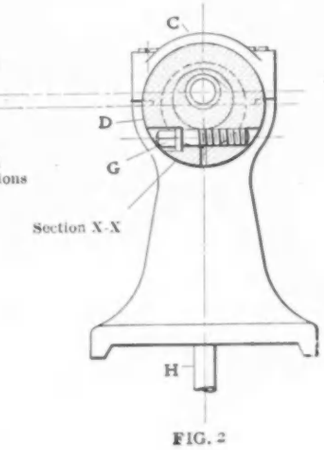


FIG. 2

ECCENTRIC ATTACHMENT FOR SMALL LATHES

There were sketches submitted, but the one adopted is shown in Figs. 1 and 2.

Fig. 1 is a section through the spindle. Fig. 2 is end view with section through *X X*, Fig. 1. *D* is the spindle and has a hole bored ⅛ inch off center. *B* is chuck holder, and the hole for the chuck is also bored ⅛ inch off center. Chuck holder *B* fits in spindle *D* and is clamped by binding screw *G*. The end of *B* is threaded to receive tightening collar *A*, which forces collet in *B* to tighten work, the bevel shoulder on *B* is graduated for the different throws desired. Pin *F* acts as a key to keep the collet from turning. The bearing *C* is fastened to the lathe by bolt *H*. *F* fits lathe spindle same as regular collet and is fastened by three screws to spindle *D*.

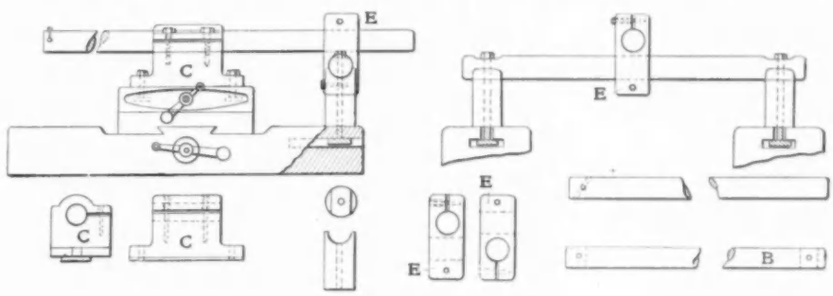
This attachment could be made shorter or longer, also to take a greater throw and could be made to fit larger lathes. It has been used for nearly a year and is indispensable for turning small eccentrics or boring holes off center. C. H. K.

Toledo, O.

A Boring Bar for Heavy Work

We were badly in need of a bar and not seeing one listed that suited I made the one shown. It was for a 42-inch lathe and I found it to work somewhat better than anticipated. I made it all of steel because this was handy, but where cast iron is in easy reach, *E* and *C* made of cast iron would answer as well with a slight change in the dimensions.

Minneapolis, Minn. W. GEORGE.



BORING BAR FOR HEAVY WORK

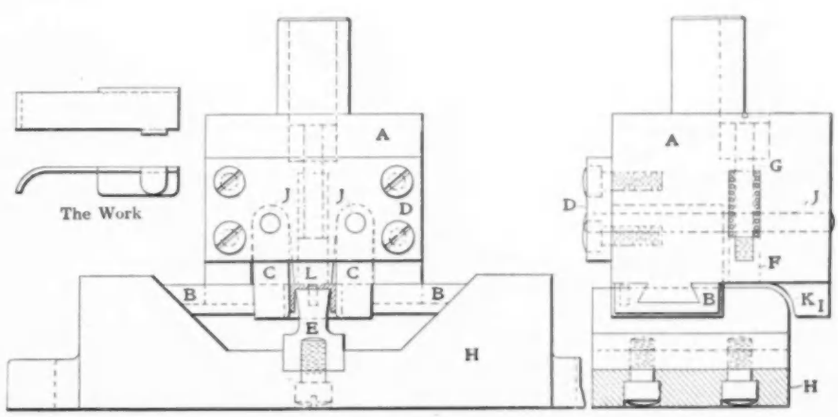
Forming Die

We had a small steel piece which, for reasons of time and cost, we wished to form up at one operation. As it had three bends to be made and as two of them had to be at exact right angles, it took some thought and experimenting to get it right.

When the tool was finished it was made as shown in the drawing. We had a tool-steel punch head *A*, which was milled out to hold the two swinging pieces *C C*, which were hung on the rods *J J*, driven into the punch head on one end and held on the other end by the plate *D*, which served two purposes, that of holding the rods and of holding in the two swinging formers *C C*.

The form block *E* was cut 7 degrees back on each side as it was necessary to allow for the spring of the metal and it took some fiddling around to find the right angles to cut it, of course, allowing that stock of the same kind was used.

The swinging formers *c c* were chamfered on the inside corners and were set far enough apart so that they would not shear the stock nor draw it appreciably. A spring plunger *F g* was put in to hold the stock down while the back end *K* of the punch head struck the blanks and formed the curved back end.



THE WORK AND THE DIE

The sliding pieces *B B* were worked on the 45-degree slides on the die plate and were so timed that they acted just when the part of the punch head *L* clamped on the piece so that when the slides struck the work they would not buckle it.

These two slides worked on a dovetailed slide milled in the sides of the punch head, and it was afterward found necessary to face the 45-degree angle on the plate with steel to prevent wear.

This punch and die cost us about $55 to build and possibly could be built cheaper in some shops. It gave every satisfaction and worked like a charm. It may look as though the stock would fly off when the punch struck on the back end, but the spring plunger took care of that and held it firmly until the stock was clamped by the body of the punch head.

Montreal, Can. P. S. HUNTLEY.

Roller Lathe Rests

The accompanying line engravings, Figs. 1 to 3 inclusive, show new types of lathe rests which are patented and have been in use in England for some two years, but which do not seem to be known in America. The feature of all of them is the rollers which do away with the danger of cutting, and the necessity of constant oiling always attending the use of the ordinary types of rests.

Fig. 1 shows a center rest, or a "center stay" as it is called in Great Britain. The case with which it is adapted to taper work is evident, while the small dotted circles near the center of the right-hand view show the adjustment for very small work. This latter position is made possible by swiveling the lower jaw on the clamping bolt. The rollers and their pins are hardened; there is no danger of cutting, or heating, or chattering.

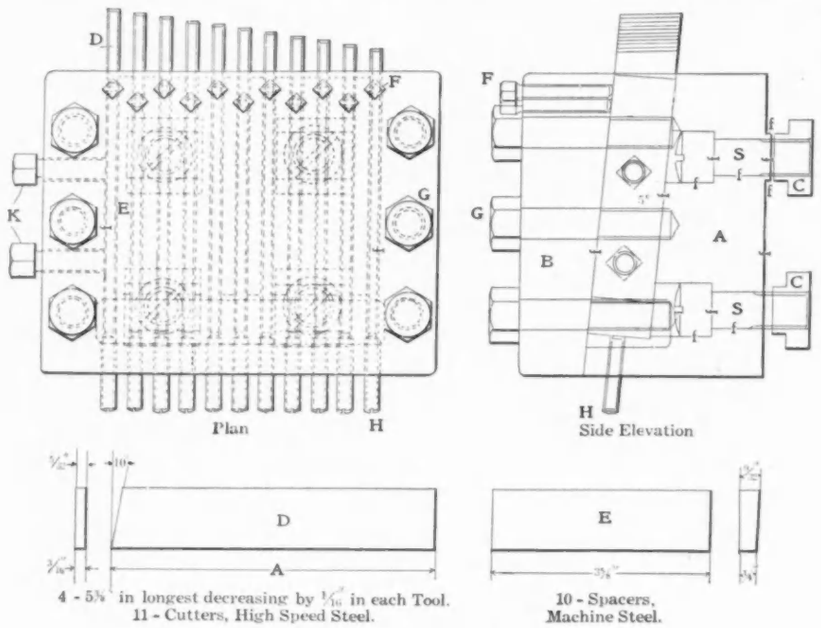
Fig. 2 illustrates a follower rest made on similar lines. With large work the thrust roller *A* is brought into use; with small diameters the upper jaw is moved back and the work is held by three rollers instead of four. See the right-hand view. This rest can also be adapted to taper work.

Fig. 3 shows a boring rest. It embodies the same principle and is intended for turret-lathe work.

Newburg, N. Y. GEO. H. HANDLEY.

Cutting-off Piston Rings

There are a number of ways of cutting off piston rings utilized by the various concerns, but the tool shown in the sketch herewith has several good points which are worthy of notice.



TOOL FOR CUTTING OFF PISTON RINGS

Generally speaking, piston rings are made from castings especially designed for this use, being cylindrical in form and having from two to four lugs (the best number is three) cast on one end for use in chucking. These cylinders are turned up in the turret lathe, to the required outside and inside diameter, the two surfaces generally being eccentric, so that when the rings are finally cut in two they will spring open. The tool shown is for use on the cross slide and is designed for a Potter & Johnston lathe.

The body of the tool *A* and the cover *B* are gray-iron castings. It will be noticed that the tools set in the holder at a slight angle (about 5 degrees is good) which brings the heavier part of the cover near the cutting point where the most strength is needed, and also provides a means of adjustment. The tools *D* are held the correct distance apart by the spacers *E*, which are, of course, varied to meet different widths of rings. Each tool is clamped near the forward edge of the cover by a set-screw *F*, and is adjusted and held up to the work by the screws *H* threaded through the back wall of the body. Two fair-sized set-screws *K* are provided for clamping all the tools and spacers sidewise, to take up any looseness

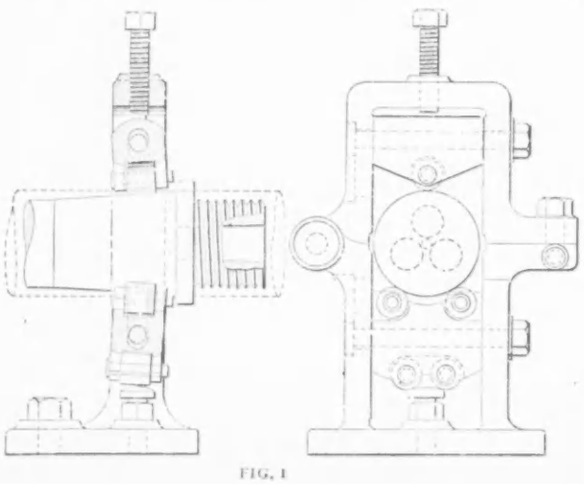


FIG. 1

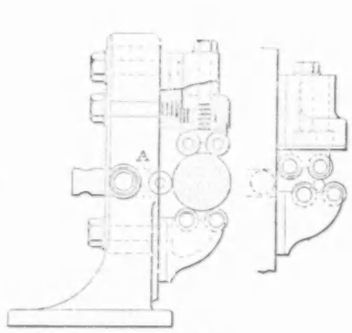


FIG. 2

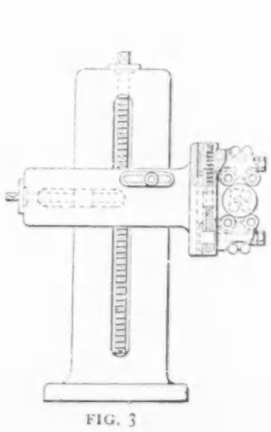


FIG. 3

ROLLER LATHE RESTS

and thereby secure even spacing of the cutters. In order to minimize the strain upon the tool and the work, the cutters are set one ahead of the other by about 1/16 inch.

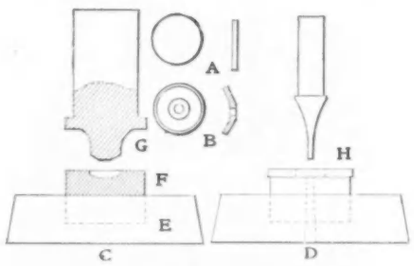
Another good feature is the method of holding the tool to the raising block on the cross slide. This is done, as shown, by use of the fillister-head screws *S*, which are set down below the line of the tools, and the regular clamp blocks *C*. The advantage of this method of holding the tool is that once the tool is set correctly it need not be moved again as the tools may be taken out and ground, or in fact the whole cover may be removed without disturbing the screws *S* at all. This feature saves a lot of time in the long run, besides tending to keep the blue tinge out of the atmosphere. The cover is held to the body of the tool by the hexagon cap screws *G*.

The tool on the whole works very satisfactorily, and while it is a little more wasteful of stock than a single-parting tool would be, nevertheless the time saved will much more than pay the difference.

Detroit, Mich. M. R. KAVANAGH.

A Sheet-metal Nut with Nurled Edges

The following is an efficient nurled clamping nut which can be made without the use of a screw machine. At *A* is shown the blank and *B* the finished nut. In this case they were blanked from 0.083-inch cold-rolled steel ½ inch diameter with an ordinary round die. *C* is the forming punch and die, *E* is the machine-steel block with the circular piece of tool steel *F* set in it. This is formed out to the shape of *B* in addition to being recessed to one-half the thickness of the stock and the diameter of the blank. This is to serve as a gage. The punch *G* is shaped to conform to the shape of the opposite side of the nut. *D* is the pressing die built up in the same manner as the forming die except that the gage *H* is a piece of soft steel fitted over the top of the piercing block.



MAKING A SHEET-METAL NUT

They may now be tapped with a hand-tapping machine and nurled in a lathe. This may be done by gripping a piece of steel in the chuck, cutting a thread and shoulder on the end, and holding the nurl in the tool post. With a little experience they may be taken off the arbor nicely by reversing the lathe and withdrawing the nurl slightly as soon as the nut is loose to prevent bending the arbor.

Sheridan, Ill. EXPERIMENTER.

A Simple Adjustment for a Grinder

Fig. 1 shows the exterior view of a simple and positive adjustment used on a grinder. The pieces to be ground are shafts having a short square at one end and a long one at the other. These two squares are milled in line; but when the shafts are tempered, some of them twist slightly. The chuck grips the shaft by the short square, and the adjustment is merely intended to compensate for any slight twist that may have taken place during the tempering operation and to equalize it so that all the stock will not be ground off one side and the shaft reduced to scrap.

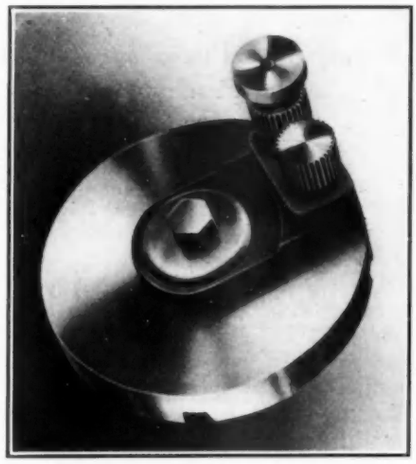


FIG. 1. A SIMPLE ADJUSTMENT

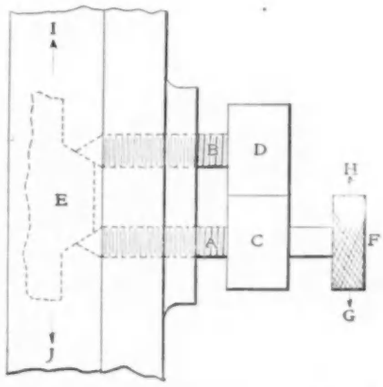


FIG. 2. DETAIL OF THE ADJUSTMENT

The wheel used is a cup wheel, the shaft passing in front of it. Fig. 2 shows the details. Two screws *A B* of the same pitch are put in tapped holes in the back of the head. They are geared together by the spur gears *C* and *D*. The points of the screws are tapered 60 degrees and bear against the hardened block *E* secured in the front part of the head, which carries the chuck. The screw *A* is provided with a nurled grip *F*. It is obvious that if the nurled head be turned toward *G*, the tapered point of the screw *A* will advance as the gear *C* engages the gear *D*, the screw *B* will be withdrawn the same amount that the screw *A* is advanced. As the tapered points of the screws are in contact with the tapered piece *E*, it will be forced in the direction *I*, advancing the chuck in that direction. Turning the nurled knob *F* toward *H* will move the block *E* toward *J*. As the tapered points of the two screws *A* and *B* are hard against *E*, it is locked in position. E. A. DIXIE.

New York.

Every Banker His Own Machinist, or How to Make Conveyer Hooks

While developing a special machine for a Wall street banker, it became necessary to make 800 conveyer hooks of sheet copper in a hurry. The hooks were like Fig. 1, punched from 1/32-inch stock, and were formed like Fig. 2. The small prongs were clinched into a 1¼-inch wide belt as in Fig. 3.

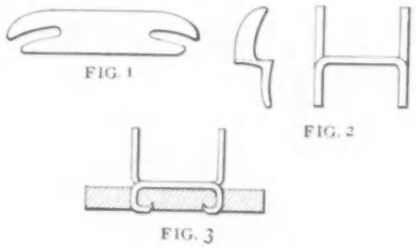


FIG. 1

FIG. 2

FIG. 3

MAKING SMALL CONVEYER HOOKS

One day at noon I started the toolmaker on the punch and die with a stripper and the following morning the boy was punching out blanks on an arbor press. About nine o'clock my employer arrived with a parallel-motion, ¼-inch belt punch, and sketches for a few simple parts to be made and attached to the punch jaws to make when completed, a forming fixture for the conveyer hooks. With one handle held in the vise the boy was able to form about 12 hooks per minute. The fixture as made shows the quality of genius possessed by my employer.

New York City. RALPH A. GLEASON.

What is a Working Foreman?

It is quite a common thing to see advertisements in the AMERICAN MACHINIST: "Wanted, a first-class working foreman." What is a working foreman? There are few if any concerns doing business who

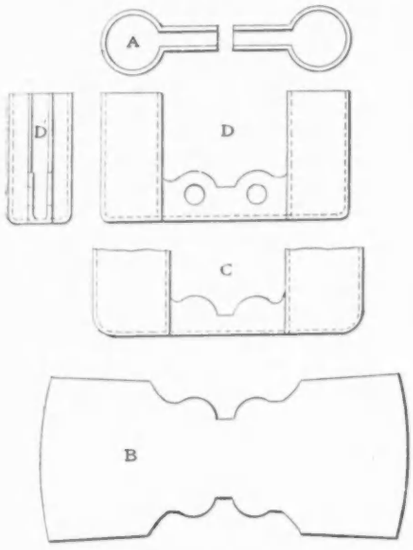


FIG. 1. THE WORK

will pay a foreman his salary if he does not work, or at least put up a bluff at doing something for his money.

A foreman's duties usually are to plan, give out work, see that it is done properly and give advice and help to those under his charge when they have new or difficult work to do. If he does this, and is able to keep things moving harmoniously, he fills the bill as executive head of his department. It is my opinion that it is a foreman's duty to help out those under his charge when they get up against it and to do odd jobs if his other duties will permit. But to expect him to work the same as the men under his charge is a mistaken idea of economy. It is a great deal cheaper to pay one man to look after a department, than to pay a whole department to look after the foreman.

To be a competent foreman it is just as essential to be a good mechanic as a good executive. He should be able to gain and maintain the confidence of the men under his charge, recognize merit and not be above adopting the ideas of others. He should be a leader and not a driver. He should never give a direct order unless absolutely necessary. The average workman will do almost anything if he is asked to do it. It takes no more time to ask a man to do a job than it does to give an order, and it is usually better appreciated. It is poor practice to tell men every time they are given a piece of work to do, that it is a rush job, and then leave it lying around for days after it has been done. Nothing fosters distrust more among men than to know that someone is trying to take advantage of them. This will surely be the case where a man has done his level best to get out a piece of work on short notice, and then it is left lying around for days. All work should be removed as soon as finished and sent to the department where it is wanted.

To be a foreman is to be the employer's representative in the department under his charge, to assume the whole responsibility of that department, to enforce rules and see that system is carried out, to be an example to the men in deed as in precept, to act in such a manner as will gain for him the respect and good will of those under his charge. Unless he is able to do all these things he ought to be holding down a less dignified position.

Plainfield, N. J. JAMES CRAN.

Drawing Two Pieces at a Time in the Punch Press

The line cuts show a job which was made a success of by the adoption of the

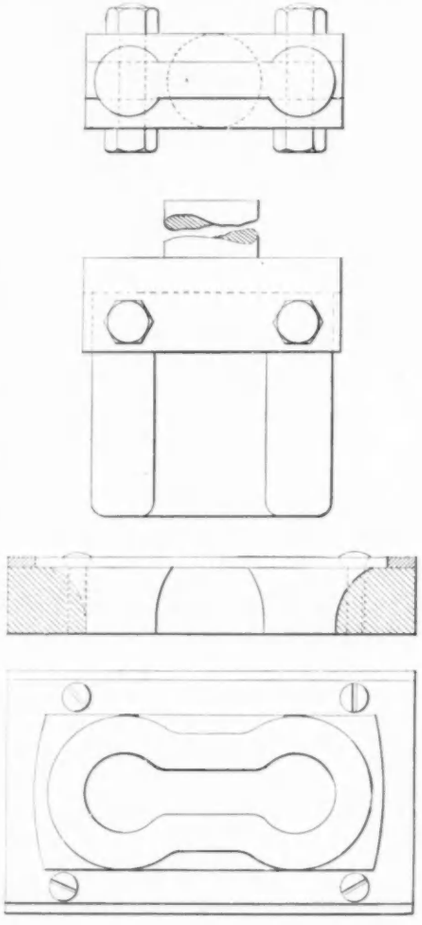


FIG. 2. THE FIRST DRAWING DIES

two-at-a-time method. A number of methods were tried, with little or no success, to produce the article (shown in Fig. 1 at *A* in plan and *D D'* in elevation). Before the method shown here, however, the trouble vanished at once, and incidentally the output was increased. Fig. 1 shows the blank at *B*, the result of the first draw through at *C*, the result of the redraw at *D*, and also the finished article after being parted off. The stock was cold-rolled steel 0.062 inch.

Fig. 2 shows the first-drawing tools, in which the die is of tool steel properly worked, hardened and tempered, with its working part left very hard and well pol-

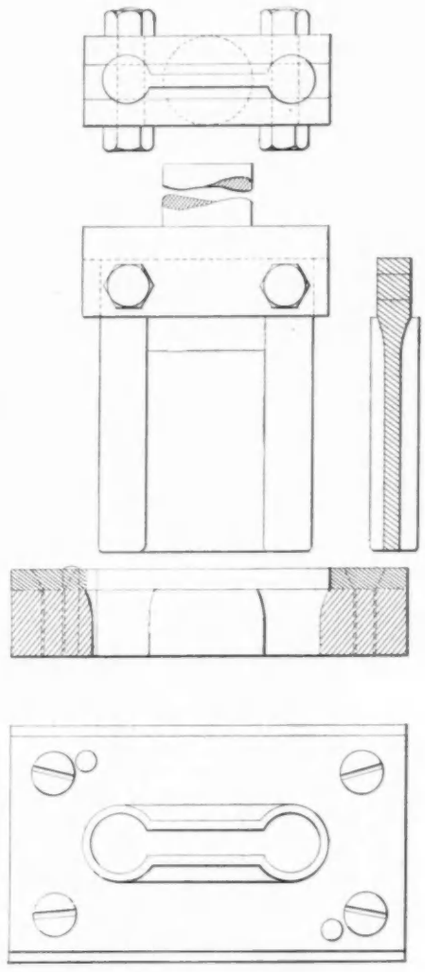


FIG. 3. THE REDRAW TOOLS

ished. The punch is of tool steel fitted to a gray-iron holder and fitted with two bolts as shown.

Fig. 3 shows the redraw tools made in precisely the same way as the first-draw tools.

Fig. 4 shows the parting-off tools, in which *A* is the punch of tool steel, *B* the gray-iron bolster, planed across to take the lower die *D* which is a drive fit, and also *C*, the top die, which is a good fit. This is held secure by two cap-screws, as shown, and two dowels which extend through the die as well, thus insuring both dies being in correct alinement.

It will be noticed that no slide is fitted to these tools. It was found that the shape of the articles was sufficient to keep them from spreading out when the punch was cutting, as they were supported by the bolster which was bored out at either end to fit the work as shown in the elevation. Attention is also drawn to the

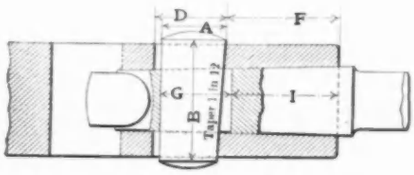
punch; this has its cutting portion formed at an angle, thus tending to keep the work on the form as it cuts at its outer end first. These tools were very successful, and when reasonable care is exercised in setting and using them, they last a long time.

WILFRED GEORGE.

Sheffield, England.

Key Slots in Drill Spindles

When using cutter or boring bars in drilling machines I have always found



KEY SLOTS IN DRILL SPINDLES

it beneficial if not necessary, to cotter them into the sockets both for security and to relieve the strain on the tang of the bar.

As cotter holes are not cut in many drilling-machine spindles by their makers, more especially the smaller ones, we had to put these in ourselves.

Being unaware of any standards for these, I have compiled the following table, which may be of use to others similarly situated:

Number of Taper.	Width of Cotter.	Length of Cotter.	Thickness of Cotter.	Length of Hole in Spindle Nose.	Breadth of Hole in Spindle.	Distance from End of Spindle.	Length of Hole in Shank.	Breadth of Hole in Shank.	Distance from End of Taper.
	A	B	C	D	E	F	G	H	I
3	$\frac{13}{16}$	$1\frac{5}{8}$	.271	$1\frac{1}{16}$	$\frac{7}{32}$	$1\frac{1}{2}$	$1\frac{1}{32}$	$\frac{7}{32}$	$1\frac{13}{32}$
4	$1\frac{5}{16}$	$2\frac{1}{16}$	.365	$1\frac{5}{16}$	$\frac{9}{32}$	2	$1\frac{9}{32}$	$\frac{9}{32}$	$2\frac{5}{16}$
5	$1\frac{13}{16}$	$2\frac{7}{8}$	.49	$1\frac{13}{16}$	$\frac{5}{16}$	$2\frac{1}{4}$	$1\frac{13}{16}$	$\frac{5}{16}$	$2\frac{13}{16}$
6	$2\frac{7}{16}$	$3\frac{7}{8}$	.615	$2\frac{7}{16}$	$\frac{7}{8}$	$3\frac{1}{2}$	$2\frac{7}{16}$	$\frac{7}{8}$	$3\frac{7}{16}$

STANDARD KEY SLOTS IN DRILL SPINDLES

England. W. J. B.

A Forming Tool-holder Slide

The illustrations show a lathe attachment recently patented in Germany by O. J. Braum, of Göttingen, and the object of which is to facilitate making small articles in quantities on the ordinary lathe. In the tool-holder in question there are three tools *f g h*, in blocks *c d e*, that slide in radial grooves *b*, in a disk *a*, which is attached to the dead-stock of the lathe. These tools are given motion to and from the axis of the disk by means of pins *i k l*, playing in the cam grooves *m n o*, of the disk *p*, which lies back of the disk *a*, and which by means of a lever (not shown in the drawing) can be set in any desired position so as to determine and limit the depth of cut of the tools.

Starting at the position in which the tool *f* stands (Fig. 2) the guide-pin *i* is at the middle of the cam groove *m;* that is, at a_1, Fig. 5. The pins *k* and *l* are at

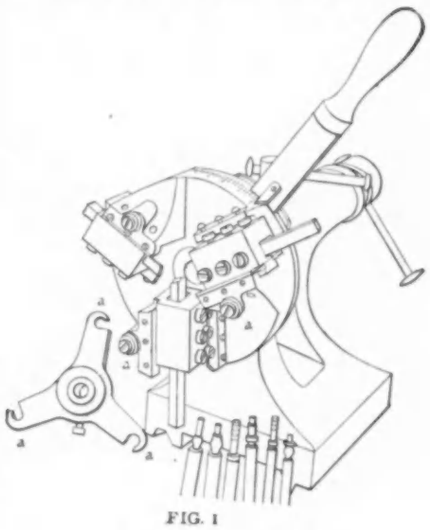


FIG. 1

FIG. 1. TOOL FOR FORMING ROUND WORK

the same time at k_1 and l_1 respectively in the grooves *n* and *o*. If the disk *p* is partially rotated in the direction of the hands of a watch the tool *f* is withdrawn from the axis of the appliance, while the tool *g* is forced toward it and of course toward the workpiece. The guide-pins of the slides *c d* and *e* will then be in the positions i_2, k_2, l_2, of Fig. 5. If the disk *p* is further partially rotated in the same direction the tool *g* will be withdrawn

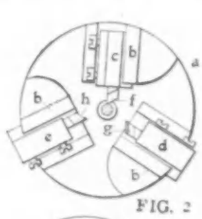


FIG. 2

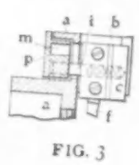


FIG. 3

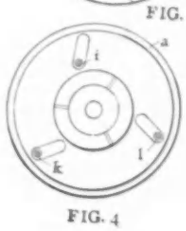


FIG. 4

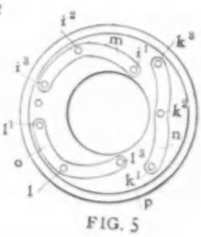


FIG. 5

THE TOOLS AND CAM PLATES

slowly, and the tool *h* forced against the workpiece. The pins will then be found in the positions i_3, k_3, l_3 of the groves *m*, *n*, and *o* respectively. The disk *p* is then partially rotated against the sun, and all tools are withdrawn. To facilitate the work the disk *a* is provided with circumferential graduations.

ROBERT GRIMSHAW.

Dresden, Germany.

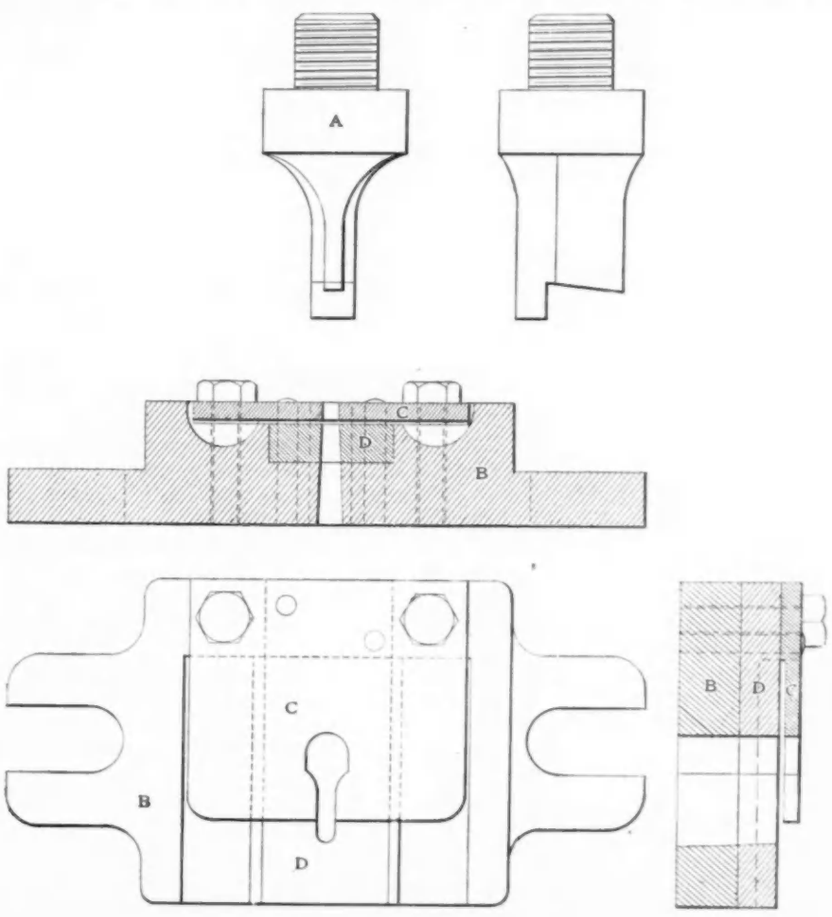


FIG. 4. THE PARTING TOOLS

Discussion of the Previous Question

Letters from Our Readers Showing How Many Men of Many Minds Look upon Various Subjects Opened up in Previous Numbers

WE PAY FOR THESE ALSO

A Job Shop Experience

An article, on page 747, about a young man and a job shop brought to my mind the experience of another young man whom we will call Jack. I was in close touch with Jack from the time he began his trade and see him now occasionally.

He was a natural-born mechanic, made good from the day he came into the shop and was soon first among a half dozen apprentices in regard to ability. He had a high-school education, was bright and not afraid of work.

He had only been in the shop about a year when he was asking everyone's opinion about a job shop. His greatest ambition was to be owner of a shop and he saved every cent that he could with that as his goal. After his time was up he was without a doubt the best young mechanic that ever left the shop; for he did leave, saying that at $1.50 a day (the rate this firm paid apprentices just out of their time) it would take too long to accumulate the price of those machine tools he wanted.

After working for the next two years in four or five different shops in as many different cities, he one day took a job running a lathe in a large plant making gas engines and got the "gas-engine fever." Jack had taken a course in mechanical drawing, and from that time on he designed and redesigned gas engines. He also read up on the subject, buying all the standard works on engines that he heard of. After a short time he was transferred to the tool room, and within a year had charge of it at $3.50 per day.

About this time Jack met a girl he could not afford to lose, so he got married and that put a serious crimp in his bank account. A year or two later the assistant superintendent resigned, and having some financial backing, organized a company to build engines, claiming he had one that would soon put the rest of the shops out of the running. Being aware of Jack's ability he hired him at a nice increase in salary to take charge of the manufacturing end of the business. Owing to poor management, a poor engine and a lack of funds, this company went out of existence a year later.

Here was Jack's opportunity. He bought the complete equipment, tools, stock, etc., at a figure that was very low. He paid in all the money he had excepting $200 and gave a mortgage for the balance. Before selling to him the owners made him sign a three-years' lease of the building at a stiff figure.

He had more machine tools than he really needed, and a smaller shop would have done as well, besides the location was not of the best. He hung out his job-shop sign, advertised in the daily and weekly papers and mailed circular letters to about 700 farmers in the surrounding country. He hired a handy man to help him take care of the trade; but work was very slack. In fact, there was another repair shop in the town besides three or four factories that were not averse to doing odd jobs when things were a bit slow in their line. After a few months he had trade enough to pay for his power and rent and sometimes pay his man's wages, but not always.

It took considerable money to pay for such stock as he needed. Jack was always a fast and hard worker, but for the next year he worked as he never had worked before; by that time he had built the patterns and core boxes for three sizes of small gas engines and had made up one of each. The engines were well designed, had good lines, were simple and substantial.

He now wrote numerous letters to implement dealers and transfer houses trying to induce them to handle his engine. He soon found that not having a rating his offers did not strike anyone as a very good thing. He had several offers from firms to take them as they could dispose of them, he to furnish a sample engine and sign a contract at a price so low that he knew he could not make them and have a profit. He was about "all in" financially. When he did sell an engine to some farmer near town he had hard competition from the local dealers, had to sell very cheap to land the sale and then use the money at once to get more castings and supplies.

He worked nights until 10 and 11 o'clock on patterns and drawings. At one time he made a complete set of drawings for a firm making a concrete mixer, for which he got a good price, but he needed the money badly then at home, as a young M. E. had arrived, and he found him quite expensive. His job work increased so slowly that he was about discouraged on that point. He was going to the wall slowly and he knew it, and made up his mind to make a last stand.

He would need all the money for his shop and would not be able to pay any of his household expenses so he called on his landlord, meat dealer and grocer and stated his condition. He proposed that they carry him on account until he was either down and out or made good with the shop. As he already owed each quite a sum they consented to his proposition for they believed him to be honest and also knew if he failed he would be able to secure a fair position in one of the shops.

He now redoubled his efforts and if he heard of a farmer that had even expressed a hope of some day owning an engine he would ride out after work on his wheel to try and make a sale. He canvassed the town for repair work, going to laundries, wood shops and printing offices. If he had a chance to sell an engine some implement dealer would be sure to get his prospective customer, tell him Jack was about ready for the sheriff and if he bought one of his engines he'd be in a bad way for repairs some day.

Jack even placed engines on trial for 30 days, hiring a dray to take them out (he had mortgaged his household goods by this time and had a little ready money). Anyone having any knowledge of gas engines knows there are about a hundred things a green hand can do to an engine that will prevent its starting; so he got some of them back and those he did sell did not give much profit as he was building one or two at a time because of a lack of funds.

Coming home to dinner one day after another disappointment in failing to make a sale, he found his wife in tears because collectors had been so numerous lately that she did not answer the bell; one had just called at the back door and insisted on having a bill paid. She had not even seen money for nearly three years.

Jack went to the shop that afternoon and closed it. After paying his man and a few small bills he found he had about $2 in cash and was in debt over $700.

He went to work for his old firm and each pay day would pay all he could on his debts. He is at the present time with another firm as general foreman at $160 a month and is worth it. He knows what belting, supplies, etc., are worth and is careful of the firm's money. He knows that the cash they receive for their output is not *all* "velvet" and knows that all the brains are not in the shop; the head of the selling department has some and so has the owner of the plant who probably isn't just lucky to have made a success of the business. He can convince almost anyone that job work at 50 cents an hour will not make a man very wealthy if he will figure his money invested, depre-

ciation, etc., unless perhaps he has plenty of work and hires only cheap men.

Jack's failure does not mean that all job shops must be failures but I believe, as he does, that it will take much time, worry and work to build up a business that will be worth while.

Jack's advice to young mechanics (and old ones too) who have a desire for a job shop is "kill it."

Madison, Wis. Y. ZIEGLER.

Trade Schools

I am disposed to supplement Entropy's remarks about State support of trade schools (printed on page 806) in the hope that it may quiet the fears rather commonly entertained as to the putting of school work on the market.

We hit upon making machinists' vises at the Artisan School: First, because we wanted vises for our own use; second, because, while the vise is a machine job, as furnished for the market they are not very fine work, and hence such work as the boys could do and produce a marketable article; besides, they gave experience on every machine in the shop. To meet the objection to our lowering the price I designed a better vise of its kind and, instead of selling at a price below others, we get about 10 per cent. better prices.

As to the possible objection by other makers, there was something I wanted to know about casting on the steel jaws and I wrote the Bagley & Sewell Company, of Watertown, probably the largest builders of vises in the country. Instead of a bluff as many would have expected they wrote me one of the nicest letters I ever received and gave me all assistance possible. And now, as to interference with legitimate business; if we ran the Artisan School wholly on vises we could probably make as many vises in a year as they make every working day in the year. There is another nonsensical point, the objection to the work of the apprentices in school interfering with the work done by journeymen outside. Why any more if done by apprentices in school than if done by apprentices in the shops? Many of the large corporations employ more apprentices than are employed in the entire shops in Syracuse. They have schools of their own working 50 to 100 apprentices. We combine and have our school with a dozen to a score. What is the difference whether one concern schools 50 apprentices or our combined industries do the same thing? Can anyone but the walking delegate, who designates the Artisan School "Sweet's School for Scabs," see any difference?

There is one machine we are building to which whoever objects it will have no effect, that is a lathe for trade-school purposes. I am firmly of the opinion that there will not in a score of years be enough work of marketable quality produced by schools to have any appreciable effect on the general trade of any kind. The cost will be too great. Every dollar's worth of goods sold will cost one or two dollars.

Syracuse, N. Y. JOHN E. SWEET.

Inserted-tooth Cutters for Milling Aluminum

I read with interest the article under the above heading, by Sydney Laurence, at page 690, and having had considerable experience in working aluminum, I quite concur in what he says regarding the cutter shown in Fig. 1 of his article, that broad, flat trailing cutters are not suitable for soft materials, as they crowd the chips under the face and produce a rough finish on the work.

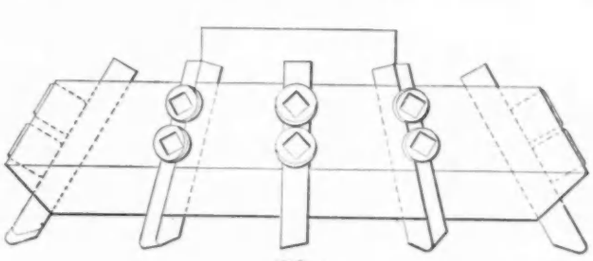


FIG. 1

FIG. 2

FIG. 3

INSERTED-TOOTH CUTTER FOR MILLING ALUMINUM

The shape of cutter shown by him in Fig. 2 is more suitable for the work, but the round inserted tools take more grinding than the one he shows at Fig. 3.

The very best cutter I have yet found for aluminum is the one here shown in Fig. 1. The blades are ½-inch square steel, and similar to the one described by Mr. Laurence in connection with Fig. 3 of his article, but the method of holding them in the gray-iron cutter head is much more secure and satisfactory. Fig. 2 shows the end elevation, and side view, of the locking screws which are 1 inch diameter by ⅝ inch long. Instead of being tightened up with a screwdriver, they have a ½-inch square hole drifted in ½ inch deep, into which a key fits with a square end, similar to a Pratt chuck key. This method insures the cutters being perfectly tight and secure. The screws are case-hardened, of course, to prevent spreading, and are sunk into the gray-iron cutter head, right up to the top; thus there are no projections whatever, which are so dangerous at high speeds. Fig. 3 shows the cutters, which also are very cheap to make, being simply cut off of a ½-inch square steel bar. They are given an outside rake of 45 degrees, but no forward rake.

In making this cutter head, the holes are first drilled, and tapped out 1 inch diameter; the head is then mounted on a universal milling machine, and a standard ½-inch keyway cutter used to gash spaces 1⅛ inches deep for the cutters straight through the tapped holes as shown.

Regarding the number of teeth in inserted-tooth cutters, for milling aluminum, I believe that the number specified by Mr. Laurence is far too small; in fact I always use quite double the number he recommends. Although each cutter is capable of taking a heavier cut than in gray iron or steel, the very quick feed (up to 12 inches per minute) calls for more cutting edges than he specifies; otherwise each succeeding cutter will leave a broad feed mark, which is not always desirable, whereas with more cutting edges, a much smoother finish is obtained.

New York City. F. RADFORD.

Tangs on Twist Drills—Taper Shanks

I have been much interested in the discussion that has been carried on lately in the AMERICAN MACHINIST about the breaking off of the tangs of twist drills. I have been looking for some statement from the makers of drills, who know more about them than anyone else, as their attention is being continually called to it in a way that should make them think deeply on the subject.

I was a foreman for nearly 10 years in a drill factory, so may be able to say a few words of interest to some of the users of these much abused tools. I want to say to start with that fully 90 per cent. of all the trouble with drills can be traced to carelessness or lack of experience on the part of the users.

I am not connected with any drill business at present so cannot be accused of prejudice. If anyone will figure out the strain that it will take to break a Morse No. 4 or No. 1 or No. 7, or a No. 9 Brown & Sharpe tang he will be surprised, and will look elsewhere for the trouble. I am thoroughly convinced that if the tangs are made so that they will not break under the strains which now break them the drill will break somewhere else. It is not work that breaks drills but abuse. It is not the man that turns out the most work that breaks the most drills.

I am satisfied that if the spindles in the machines in which these tools are used were kept properly adjusted it

would cut down the breakage more than one-half; the other half is caused by lack of experience on the part of the the workman. If you have from 1/64 to 1/16 inch end play in the spindle, as is often the case in your drill press, when the point of the drill goes through the work the torsional strain on the shaft due to the pressure when the point was cutting, forces the lips of the drill into the stock, especially if it is not soft steel, and something must give way. I will make a suggestion here for the benefit of those who think that the drills are at fault: Have your toolmaker reharden the tang and draw the temper to about 500 degrees; that is the temper which has stood the greatest strain with us. The plan which we intend to carry out in our shop is this: It is the duty of the assistant foreman to see that every machine in the shop or in his department is kept in proper shape. We hold the foremen responsible, after making sure that the general methods are right and our freedom from broken tools proves the wisdom of our position. We do not expect a loss from broken drills or other tools, and we do not intend to spend any money on the new tangs.

Bethel, Vt. A. HENRY MATSON.

Robert Brown's remarks at page 774 concerning taper shanks and tangs are right to the point. The abuse of taper shanks and taper holes in sockets in the average machine shop and manufacturing department is really startling to anyone who takes the trouble to investigate it, and one of the reasons is the absence of one standard taper in the machine-tool business. While drill-press tools are usually Morse taper, and milling-machine spindles Brown & Sharpe, the dimensions of both of these are such as to make their reproduction difficult without expensive gages. Many home-made tools don't get a good hold in the taper hole, and the strain comes on a portion of the hole and distorts it, so that the machine soon has what an old-fashioned friend of mine called a "universal taper," that is, it would fit one taper as badly as another. I know of one large concern who adopted the Jarno taper, and who found that by putting the spindles of all their machines in good condition, making collets with a Jarno taper inside and using draw-in bolts on all large arbors, collets and shank cutters, where possible, they could cut off the tangs of practically all their large assortment of special arbors, collets, shank mills, counterbores, etc. On some of the larger cutters where collets were used the collet was bored out at the rear end to allow the machine draw-in bolt to reach through and screw directly into the shank of the cutter. Give a little attention to the taper hole, and even where necessary to use the tang shank, there will be little trouble.

ARTHUR FREDERIC.

Philadelphia, Penn.

A Time Recorder for Machine Tools and Other Discussion

When I read Mr. Chard's article on a "Time Recorder for Machine Tools," at page 595, I wondered about a few things. In the first place I wondered if this device was a sort of spying scheme to see whether the men were doing what they ought. If that is so, and if I were working in that shop I could keep my countershaft running much more time than was necessary. If I had a planer to run I wouldn't stop the countershaft from morning till night. If it was a turret lathe with friction geared head I could keep that going, and even on an ordinary lathe I could just let the tool rub up against the revolving work while I went off to grind another one, or went to the lavatory or on any other useful or "unuseful" trip.

If the machine is used to find out data as to the proper cost of doing work, it seems to me that results could be accomplished best by having an expert do some of it, and use his record as a basis for comparison; not of the time the machine might be running, but of the time elapsed and paid for, from the beginning to the end of a job.

Two men might take exactly the same time to do a job, say on a planer. One might take plenty of time to set up his job solidly and then run a heavy cut over it, loosen up a bit and finish with a broad tool. The other man might set up his job quickly enough and then be so afraid that his cob house would tumble down that he would merely nibble away at it. With Mr. Chard's scheme to go by the latter man would get the most credit, for his machine would be running the larger percentage of the time, unless, of course, the other man kept his countershaft going all the time and depended on his belt shifter to stop his machine. If he did stop his machine that way he would not do it to deceive the shop management, but simply to get as great credit for what he did as the other man, which is very necessary in these days of sharp competition between workmen as well as firms.

Again, it seemed to me that in order to interpret this time record in such a way as to be of any value it would be necessary to have a clerk watch the man to see just what he was doing. If the thing is of any value at all it is on changing jobs. That is where the greatest difference appears between what I like to call machine operators and machinists. A man of wide experience will take a totally new job and reason out so quickly the best way to hold it to machine it and how to change and set his tools that to the unitiated it seems like intuition. On the other hand, a man who simply knows how to operate a certain machine tool will often be stuck absolutely by a job that is simple enough but which he never happened to see before.

AFTER I HAVE SERVED MY APPRENTICESHIP, WHAT?

This in turn reminds me of Mr. Dombirer's article, at page 597, suggesting the desirable policy for the graduating apprentice.

I cannot say that I agree fully with him as to the desirability of staying right along in the old shop. For one thing, to the old shop he was a kid, he is a kid and he always will be a kid, unless he goes away and comes back again after a decently long interval. For another thing, in the old shop, as Mr. Dombirer suggests, he has a boss who would look on him with patience, and I say also a boss to whom he has gone and will continue to go to find out how to do countless jobs that he might much better have thought out for himself. If he goes away and has to make a new boss sympathetic he will find that it is often up to him to do jobs that might never occur in the old shop even if he stuck there a hundred years; he will find that no matter how much his old boss knew the new one will have some ways of doing things that will seem to him so ludicrously simple that he will wonder how they ever missed it at the old shop.

THE SHOP CLOCK

Then about the clock. I believe in keeping a clock in sight. Not just to see when quitting time comes, but to see how much time I was using up on one job as compared with another. If I had a dozen pieces to plane and I did not do each one a little quicker than the previous one I would know that I was either growing tired or lazy. If each one came along a little faster I would know that I was doing my duty by myself, and incidentally by my employers; though I should expect them to pay for it in the end so that would not make much difference. I lay this stress on the time taken because now-a-days the quality seems to be becoming a more and more fixed thing. It is getting to be a question of gages; "go in" and "not go in." A pretty definite quality is required, and better than that is not wanted, so time is about all there is left to improve on. If a man does not keep a watch (or a clock) on his own movements he is sure to slow down, until by and by he is as moderate as a policeman.

Most men will not watch themselves so they have to pay other men to watch over them. That is they have to pay indirectly for supervision. The firm takes it out of their pay and pays it to a man whom they select. If all of us could be depended on to do what we ought then we could divide the pay that our foreman gets among us and the firm could simply pass out the work to us direct and they would be just as well off; we would be better. A foreman, then, is a sort of animated clock going around to one after another and gently pointing out that time is passing; but he is human himself, and prob-

ably does not know how quickly you ought to do a job, in which case he does not answer the purpose of a clock nearly as well as the real thing.

Foremen's Meetings

Still another thing of which I am reminded: Mr. Evans' article, on page 613, refers to weekly meetings of foremen in the navy yards. A foreman, being human, needs a clock to look at as much as his men. These weekly meetings of foremen answer just that purpose.

Unless a man is spurred on by the fear of losing what he already has he will become lax and fall behind in his work, or unless some incentive is given other than daily pay. Any job that looks like a life's job is nearly fatal to any progressive faculty that its holder may have had. If a man has money invested in a business it is not the desire to make money that keeps him everlastingly at it, but the fear of losing what he has. That same fear keeps him putting all he can spare of his profits back into the business in the endeavor to make safe what he already has there. That gives the head of the firm incentive to work. He must give his foremen some incentive. Good pay is all very necessary to keep them good natured, but its effect is short lived as to work. The feeling that one's work is open to a certain sort of publicity and is liable to be criticized before others is the strongest possible incentive to continued effort. Many a man who would care nothing for a private call down from the office will quake before half of the same "wigging" given in front of his associates. On the other hand, he is, by the very fact of the meeting, sure of a chance to defend himself. A despotic manager, or a dishonest one won't keep up these meetings long.

Student Built Machine Tools

One more comment on the April 16 issue and I am done. Mr. Hayes' article on page 624 sounded so like what I might have written that I had to look for the signature before I was sure. Now do not jump at the conclusion that Truman D. Hayes is one of my pen names, because there is a real flesh-and-blood Hayes. I do not fully agree with him, however, when he intimates that it would be necessary to presume pupils of a trade school capable of building machine tools or woodworking machinery. When you come to think of it, to walk from Portland to Chicago simply means the placing of one foot before the other a certain number of times, a thing that practically every reader of this paper has done. The only thing that makes one performance of this kind differ from another is the time taken. Just so with the building of a machine tool. Analyzed, it simply means the doing of a certain number of comparatively simple jobs, any one of which can be taught to a very young boy in a short time. The thing which is difficult is to teach all these things to one boy, or to get a number of boys to do all these things in a reasonably short time. Given all the time wanted, there is no excuse for not turning out an acceptable machine tool.

Springfield, Mass. Entropy.

Joints and Fittings for High Pressures

Referring to the interesting article by B. C. Batcheller, on page 633, with respect to the Rapieff flange joint, this scheme is probably the best for packing joints under high pressure. But it is my impression that the designs illustrated in the article are unnecessarily elaborate to secure the desired result. Fig. 1 illustrates this same practice as applied by B. V. Nordberg to a pump chamber on a high-pressure pumping engine designed some 12 or 15 years ago and built by the Nordberg Manufacturing Company. It will be noted that the joint consists simply of a V-groove turned in each flange, and instead of allowing an overflow space for the packing it is only necessary to have the recess slightly larger than the packing. This joint was very successful under about 500 pounds per square inch water pressure.

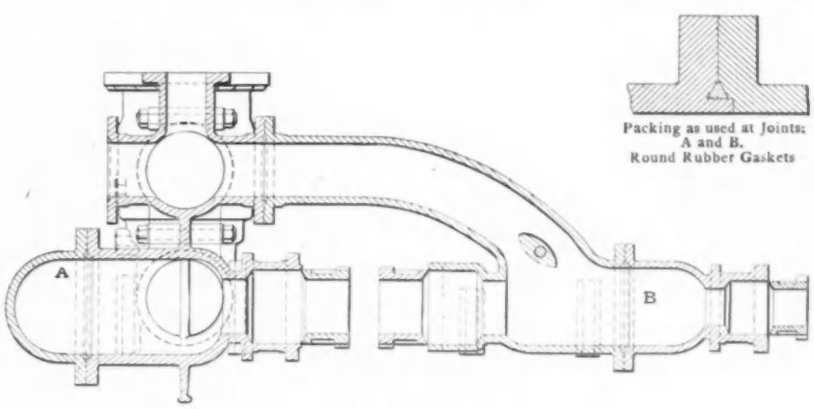


Fig. 1. A high-pressure pipe joint

A still simpler form of joint used by Mr. Nordberg on high-pressure pumps and gas compressors is shown in Fig. 2. Here the recess is formed in one side of the joint only, the other is left flat thus saving machine work; but the joint has been found to be just as successful under 750 pounds pressure. It frequently happens that a joint which is amply strong will leak due to springing under pressure. Such trouble may often be cured by adopting this style of joint.

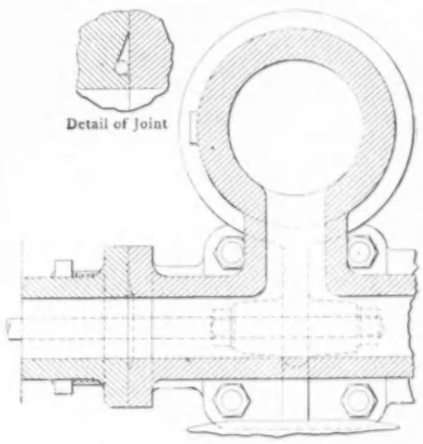


Fig. 2. A modification of the joint shown in Fig. 1.

A case in point was a natural-gas compressor where the pressure was raised much above that for which the compressor was designed. As a result the suction-valve bonnet was sprung enough to leak. This type of joint cured the trouble. It is hard to understand why this type of joint is not in more universal use in high-pressure water systems.

It is now quite common practice to use round rubber gaskets instead of flat gaskets on large riveted pipe where flanges are composed of angle irons, and, therefore, are more or less irregular. In this case no recess is made in the flange to receive the gasket, but the gasket is much more successful than flat gaskets and much easier to erect. I have used such construction on pipes of 40 inches diameter under pressure of 50 to 75 pounds.

New York City. F. W. O'Neil.

Of the Japanese imports of iron and steel from the United States there was an increase of but 18 per cent. in 1906, as compared with 1900, but the increase of imports of machinery of various kinds, made wholly or largely of iron and steel, was from $859,415 in 1900 to $2,601,146 in 1906, while imports from all countries combined increased from $2,566,664 in 1900 to $7,084,470 in 1906. This is a most gratifying showing for expansion of trade in machinery made of iron and steel, and it is largely along this line that American trade with Japan, as well as with many of the other countries in the Far East, is likely to continue to grow.

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The New British Patent Law

The new British patent law, by which compulsory working of patents in Great Britain is required in order to maintain patent protection is arousing attention in Continental Europe as well as here. A recent issue of *Engineering* makes note of this state of affairs and quotes the following from the German publication, *Kreuzzeitung*:

"England continues to pursue a policy of protection under a free-trade mask, and she chooses methods of so doing which must be described as unfair, in view of the fact that German interests are seriously affected thereby. There are grounds to fear that the hostility between Germany and England will again be intensified if the British do not check their Protectionist tendencies, and if they persist in putting into operation this new patent law, which is incompatible both with free trade and a fair commercial policy."

Coming from Germany, where a similar though somewhat less stringent law has been in force for many years, this complaint, whether strictly logical or not, is curious reading. Of leading industrial countries the United States only has no such law and hence is the only one which can consider itself aggrieved in this matter, and, as regards ourselves, the English people are no doubt fairly entitled to consider the account squared by our policy of protection.

Our object in reverting to this matter at this time is to quote from the reply which *Engineering* makes to this complaint, as follows:

"For upward of a quarter of a century Great Britain has been exposed to attacks on her industrial life through the abuse by foreigners of her patent laws. To put the case briefly, British patents have in numberless instances been obtained by foreign manufacturers and used simply as cover for the importation into England of goods made abroad under the corresponding foreign patent; or, perhaps, not even under any patent at all. As the result of this practice, the British nation has suffered a three-fold injury. It has been made to pay long prices for the patented article imported from abroad; it has been deprived of the advantage of participating in the manufacture of the patented article while the patent existed; and, finally, when the patent expired, it has been placed under the disability of lacking the practical knowledge and experience essential to enable it to start and carry on the manufacture in the teeth of foreign competition."

Excepting always the partially counteracting influence of our tariff laws this reply applies exactly to our own condition, and no better word in favor of the passage of a similar law by Congress could be said. As the matter now stands our patent laws protect foreign industries conducted on foreign soil and tax our own people roundly in doing it. By making competitive production here impossible they enable a foreign patentee to produce his goods at home, ship them in regardless of the tariff and add the duty to the price. Intended to promote home industry they are, in this application, the baldest of absurdities.

Technical Misnomers

We sometimes smile at the unfamiliar look of common words after they have undergone a simplification in spelling at the hands of the Simplified Spelling Board, although we may be heartily in sympathy with the results which that board is trying to accomplish; but at the same time do we realize that a Simplified Naming Board might be created to advantage to deal with certain technical and mechanical terms? Our technical vocabulary contains numberless examples of the names of common animate and inanimate objects that have been applied to parts of mechanism. For illustration consider the word "dog." When used in common speech it applies to a canine, but in technical speech it applies to any one of several pieces of mechanism. Many proper names, also, have been adopted as the names of mechanical objects and quantities, in honor of eminent inventors or discoverers. For such nomenclature we have nothing but commendation.

There are, however, certain duplications of terms for the same thing where no one of the individual terms seems suited to or descriptive of the object. Consider the kinds of steels that have come into general use for cutting tools during the last few years; steels which are the lineal descendants of time-honored "Mushet."

To contrast these new steels with those in common use for such tools we call the common steels "carbon steels." This term is descriptive; the qualifying word is the name of the principal alloy combined with iron to form the steel. In the newer steels, although carbon is present in nearly the same proportion as in carbon steels for a similar purpose, other alloying elements are introduced which are either tungsten, molybdenum or a combination of both. But instead of following the analogy set by the older kinds of steel in naming the newer kinds, and calling them tungsten steels, or molybdenum steels or tungsten-molybdenum steels, there are four expressions which have been used by technical writers to a sufficient extent to be noticeable. They are: high-speed steel, high-cutting steel, high-heat steel, and high-duty steel. The first expression is the most common.

To consider briefly these in reverse order, the word "duty" as used in ordinary speech or writing carries with it the idea of obligation; in mechanical matters

it refers to the foot pounds of work per unit quantity of coal in connection with the performance of steam engines. The high-duty engine is one which gives a large percentage of foot pounds of work from a unit quantity of coal. Neither of these ideas conveyed by the word "duty" seems to fit steel. The steel has no high obligation, nor has it any high foot pounds of work as referred to coal, although it can do more work, that is, remove more metal under a given set of conditions, than its predecessor, carbon steel.

The expression "high-heat" is descriptive of the process of heat treatment in order to make cutting tools from this kind of steel. It is in no way descriptive of the steel itself, nor of the results that the steel can give. We do not know that further investigation may not give us steel which will do the work now done by these high-heat steels and still be capable of being hardened from a much lower heat. There is still another way in which this expression may be looked at; that is, that the word "heat" refers to the temperature to which the tool can be subjected when cutting and still be able to cut successfully. But, even so, it is not descriptive of the steel itself.

What thought do we get from the expression "high-cutting?" If this means high-cutting speed, or high-cutting capacity, it is truly descriptive of what the steel will withstand or of one of its qualities. Thus it is better than either of the other two expressions which we have briefly analyzed. But this expression is not descriptive of the steel itself. If other steels are developed which have greater capacities for speed and work, we may have to fall back upon such expressions as "higher-cutting" steel, or "highest-cutting" steel to establish a distinction.

Our last expression, "high-speed," is most commonly used and justly so. As applied to tools which have motion of their own, as milling cutters, twist drills, and the like, the speed at which they can be revolved, compared with similar carbon steels, is high. Similarly, if the tool is stationary except for the matter of feed, as in a lathe or planer, the speed at which the work rotates or travels past the tool is very much increased over that which is possible with carbon steel. Thus the expression is descriptive of the conditions under which the steel is used. If we consider a more figurative meaning of the word "speed," we find that "high-speed" may mean high progress or high success. Both of these expressions are clearly applicable to the results obtained, but do not describe the steel. The distinguishing quality in this high-speed steel is the retention of temper under severe conditions of working. Properly heat-treated the temper seems to be a fixed quantity for given tools made from given brands of steels. Thus the steel might have been referred to as a "permanent temper" steel, or by some equivalent expression. This would have been as truly descriptive of the steel as an expression made up from its chemical constituents. The term "high-speed" is descriptive of its results, is in general use, and is generally understood. It deserves to live and undoubtedly will live. The other three expressions deserve to be, and undoubtedly will be, forgotten.

Therefore, in selecting new technical names and expressions, care should be taken to make them descriptive as well as etymologically consistent; for such a course will tend toward more exact thought and more accurate expression.

New Publications

FORMULAS IN GEARING. Fifth edition. 183 6x9-inch pages. The Brown & Sharpe Manufacturing Company, Providence, R. I. Price, $1.50.

We are glad to notice the appearance of a new edition of this well known book, which contains perhaps the most useful collection of information regarding gear cutting in existence. From the nature of the subject, and for real simplicity, the information is largely in algebraic form, although the formulas are so extremely simple as to require only an elementary knowledge of algebra and trigonometry on the part of the reader. The book contains probably the most complete table of prime factors in existence in English, and also an extensive table giving all the leads that can be obtained with any possible combination of the change gears furnished with the universal milling machines made by the Brown & Sharpe company, as well as a new table for plain and differential indexing of their machines. The entire subject of differential indexing has, in fact, been rewritten and greatly improved. The book is an example of high-class but thoroughly practical technical literature, and should be in the hands of every mechanic who has to deal with gear problems.

TESTS OF CONCRETE AND REINFORCED CONCRETE COLUMNS. By Arthur N. Talbot, 59 6x9-inch pages, 25 illustrations including numerous plotted diagrams. Bulletin No. 20 of the Engineering Experiment Station of the University of Illinois, Urban, Ill.

From time to time we have reviewed bulletins from the University of Illinois with pleasure and appreciation. The work which the Engineering Experiment Station is doing in investigating engineering problems is highly commendable; the selection of problems is happy and opportune; the treatment is in accord with the best of engineering practice, and the results and conclusions, as printed in the bulletins, are in a usable form. The one before us is fully in keeping with the record already established. It gives the results of a number of tests on concrete columns to determine the effect on the column's strength of steel hoop reinforcement. Two kinds of reinforcement were used; one is referred to as band-hooping, the other as spiral-hooping. A general formula is developed for the strength of columns thus reinforced. It is:

$$c = c' + pc''$$

where c is the maximum strength of the hooped column, c' the strength of the plain concrete column, c'' a coefficient for the hooping and p the ratio of the reinforcement, found by dividing the total volume of the hoops by the volume of the concrete core within the hoops. For band-hooping c'' is given as 65,000; for spiral-hooping c'' is 100,000.

Personal*

T. F. Salter is now located in a new position as chief engineer of the Standard Roller Bearing Company, Philadelphia, Penn.

Edward A. Marsh, for a long time general superintendent of the Waltham Watch Company, has recently retired, having completed forty-two years of consecutive service.

Claire L. Barnes, sales manager of the Detroit Steel Products Company, has resigned that office to assume a similar position with the Billings & Spencer Company, of Hartford, Conn.

At the 34th annual commencement of Purdue University, the honorary degree of doctor of engineering was conferred upon Angus Sinclair, proprietor and editor of *Railway and Locomotive Engineering*

F. J. Smith, president and general manager of the S. W. Card Manufacturing Company, has recently returned from a three months' trip abroad, where he has been looking into the conditions of business.

C. S. Redfield, advertising manager of the Yale & Towne Manufacturing Company, and recently elected president of the Technical Publicity Association, sailed with his family for a three months' trip in Europe.

William C. McBain, formerly employed in the erecting department of the Westinghouse Machine Company, has recently become chief engineer of the Kansas City and Olathe Electric Railroad Company, Merriam, Kansas.

Jos. Campbell, president of the Diamond Saw and Stamping Works, Buffalo, has just returned from an extended trip in Great Britain. While there he arranged for a new representation through John G. Rollins & Son, 124 Holborn street, London, E. C.

*Items for this column are solicited.

New Tools and Machine Shop Appliances

Showing New Ideas in Machine Shop Equipment That Make It Possible To Do Better Work at a Reduced Cost

THE LATEST INFORMATION

Automatic Worm-wheel Hobbing Machine

The illustrations show a machine which was designed for automatically hobbing large quantities of several sizes of worm-wheels on a manufacturing basis. These wheels were made of forged steel, and were of several diameters and dimensions, being such as are used in chain blocks, jack-screws, etc. The construction of the machine generally is shown by the three views. The belt drive is effected by means of tight and loose pulleys. The driving shaft is splined, to allow the hob carriage to be adjusted to and from the column to accommodate the different sizes of blanks.

The driving shaft then operates the train of change gears, as is seen by Fig. 3. These gears are placed according to the ratio of the number of threads in the hob to the number of teeth to be cut in the gear.

As large quantities of each size gear were to be cut, it was decided to use a cam-feed, the cam being driven through change gears which are operated from the work-spindle. The cam is shown in Fig. 4. It was laid out to start quickly, so as to bring the blank down to the top of the hob, as the blank cleared the hob

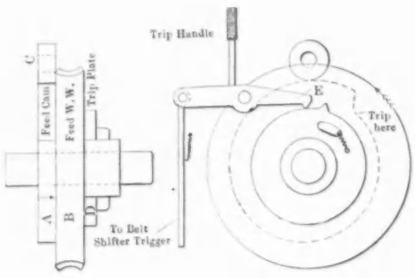


FIG. 4. DETAILS OF HOBBING MACHINE

teeth to the amount of the concaved portion of the face, so as to allow the blank to be placed on the arbor. The feed is practically constant until the gear is about finished, and is then diminished, and for a short space there is no feed. Then the roller drops into the starting position, and the finished worm-wheel rises away from the hob.

The feed-cam is driven by the change gears seen above the master wheel in view No. 3, and also through a worm and wheel reduction. If a wheel is to be cut with a large number of teeth, the blank revolves slowly by means of the change gears, and this operates to revolve the feed-change gear train very slowly. When a wheel with a less number of teeth is to be cut, the blank-revolving train and the feed train run at a higher speed and the cam is thus revolved faster, so that the time required to finish a gear is proportional to its number of teeth. For different tooth depths, different cams may be used, but with one cam the rate of feed may be varied by means of the change gears in the feed train; and this rate of feed (or size of chip) will automatically remain the same for all sizes of blanks, inasmuch as it is always driven from the work spindle.

In order that the machine stop itself upon the completion of each gear, the

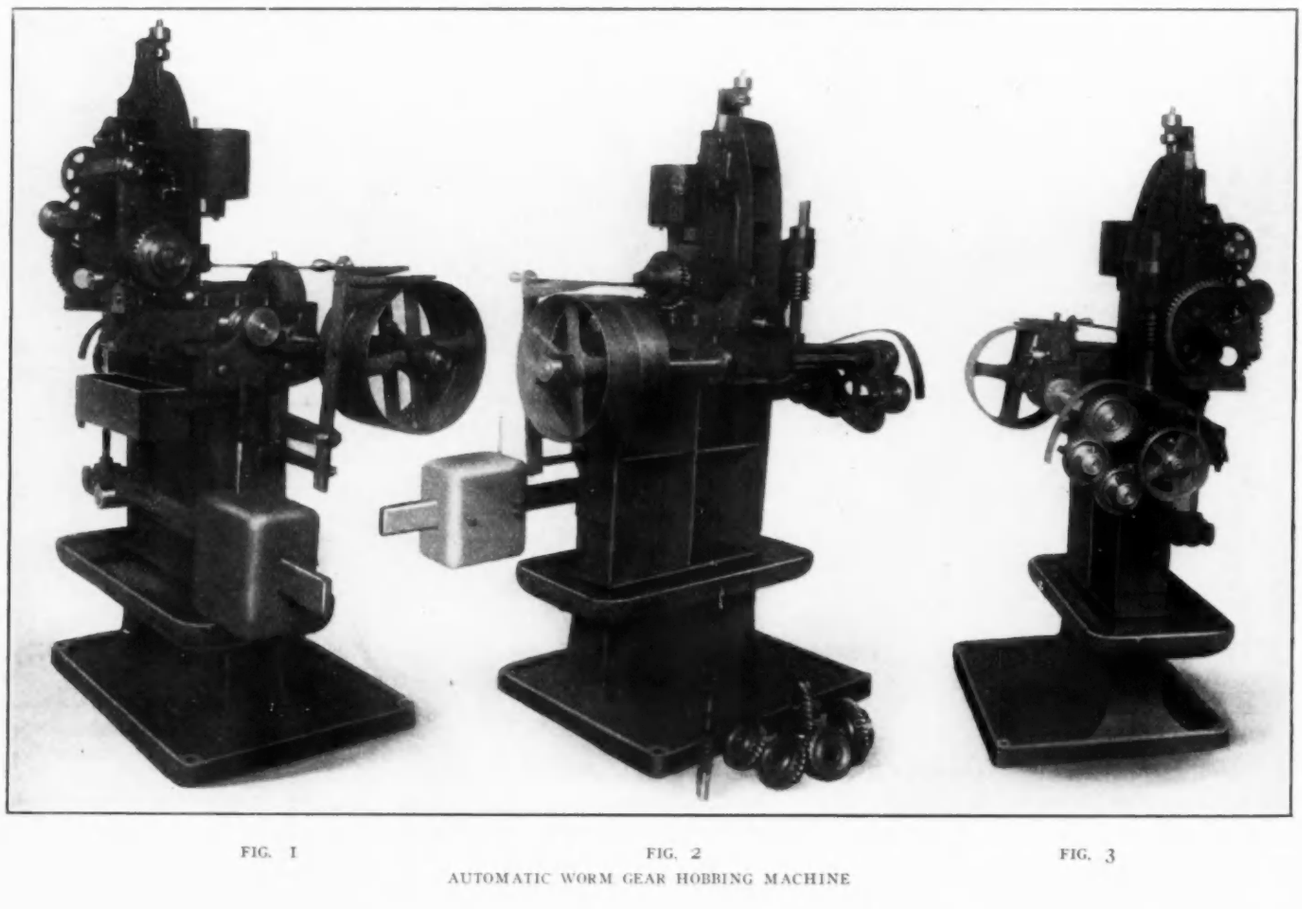


FIG. 1 FIG. 2 FIG. 3

AUTOMATIC WORM GEAR HOBBING MACHINE

belt shifter is provided with a spring and latched lever, which are released by a trigger operated from an auxiliary cam or "trip plate" on the feed-cam, as shown by Fig. 4. It can easily be seen that a projection upon the feed-cam itself would not satisfactorily accomplish the result, because the projection would remain under the lever *E* after it had stopped the machine. The projection would thus be in the way of the lever when it is desired to start the machine up again. By using the movable "trip plate" *D* having the slot and spring connection, the lever *E* will hold the plate back until it is positively lifted up. Upon the lever being lifted over the projection, the plate is pulled forward by the spring, and is thus away from the lever, and ready for starting.

The hob spindle is provided with a taper hole, so that the hobs can be made solid with taper shanks. The shanks are threaded internally, so that the hobs may be drawn into and forced out from the taper hole positively, without hammering. The other ends of the hobs are ground straight to fit the hole in the outboard bearing. The work arbors are provided for similarly, and the rear view of the machine shows the handle for drawing the arbors in and forcing them out.

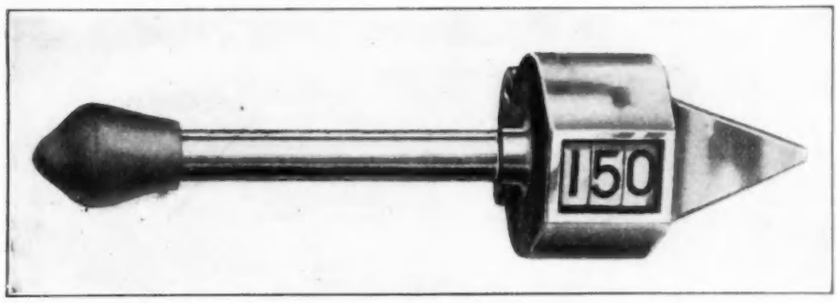
The work head is counterbalanced, so that the roller on the feed-cam is held against the cam and away from the hob. A screw is provided for vertical adjustment of the head, to accommodate the different diameters of blanks to be cut. On the floor, in Fig. 2, can be seen some of the finished blanks, as well as the hob.

The machine is designed to hob the wheels without the necessity of previous gashing. A blank is placed upon the shoulder arbor, and the shifter lever is drawn over so that belt starts the machine up. The machine then automatically feeds the head downward until the proper depth is cut; upon which the head returns to its original position and the machine stops. The blank is then clear of the hob and can be removed. All the movements are made in the quickest possible time, and the only attention required from the operator, is to change blanks. It is made by the Eberhardt Brothers Machine Company, Newark, N. J.

Vest Pocket Speed Counter

The speed counter herewith illustrated is not quite three inches in length, and although very small and convenient to carry, is by no means fragile. It registers the exact number of revolutions.

When indicating, the initial reading is taken and the final reading subtracted from it to obtain the number of revolutions. This speed counter has been placed on the market by the American Steam Gage and Valve Manufacturing Company, 206 Camden street, Boston, Mass.



A VEST POCKET SPEED INDICATOR

A Hack-saw which Revolves the Work Being Cut

This hack-saw differs, we believe, from any other on the market in turning the stock under the saw while being cut. This corrects the tendency to run to one side and produces work that is square within a very few thousandths of an inch. Measurements of several thin pieces sent in, about ⅜ inch in thickness, showed variations of not over a thousandth at a number of points the same distance from the center. The center was very naturally about two thousandths thicker than the edge.

The machine requires very little description, as Fig. 1 shows how the saw is driven and the work revolved, the roller support at the left being used for long work. The chuck is made on the principle of the closing square hole which is just being discussed, and is shown in Fig. 2. This is operated by one screw and takes in any size from ⅜ up to 6 inches.

The stock is revolved toward the gears and the movement takes place at the same time as the saw moves forward, by adjusting the balance weight so as to let the saw make a light cut in starting to cut squares and flats and an adjusting collar on the saw guides assists in the cutting of

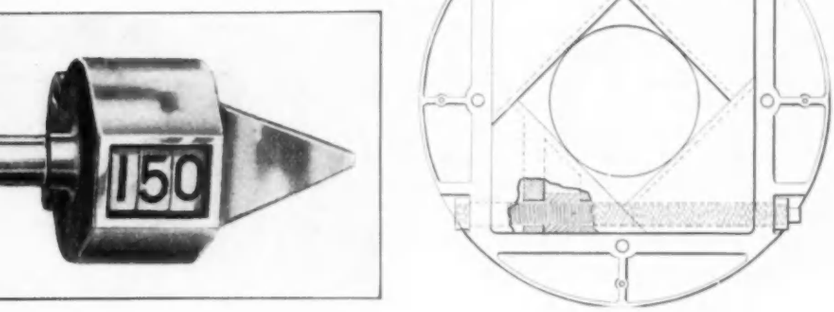


FIG. 2. THE CHUCK USED

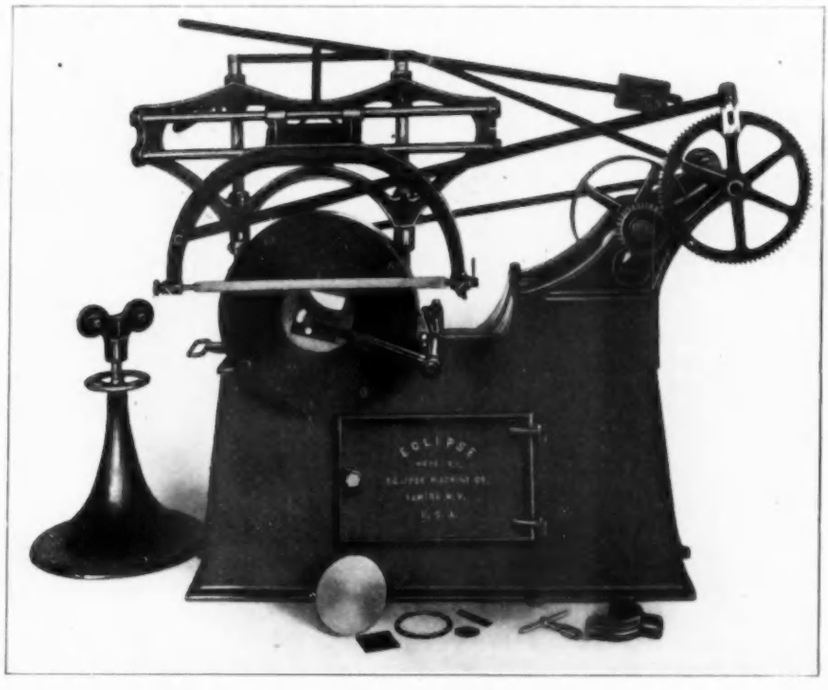


FIG. 1. HACK SAW WHICH REVOLVES THE STOCK

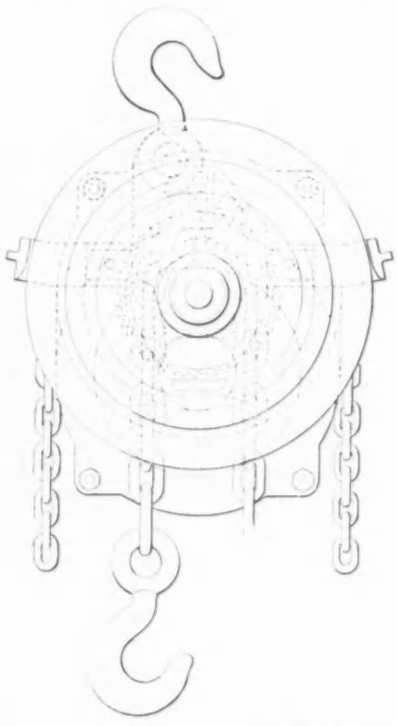
tubes without difficulty. It occupies 2x4 feet floor space, weighs 650 pounds, being built by the Eclipse Machine Company, Elmira, N. Y.

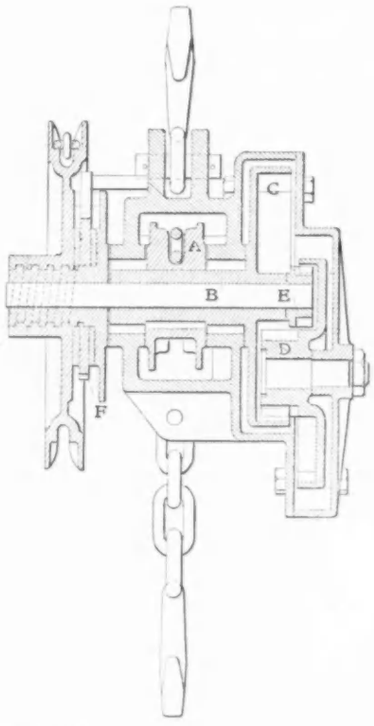
The Climax Hoist

This is a plain spur-gear hoist with two internal gears and two pinions besides the usual chain blocks and housings.

The principle of operation is as follows: The load chain runs in sprocket *A*, keyed to a long hub or sleeve *B*, supported in housing and cast in one piece with an internal load gear *C*. This gear is driven by a spur pinion *D* carried on a stud which is in one piece with an internal gear driven in turn by a spur pinion *E* on the hand-chain wheel-shaft. This passes through the hub of the load gear to the opposite side of the block where the hand-chain wheel is located. Hoisting is accomplished by pulling on right-hand side of hand chain, thereby rotating the mechanism, and lowering is done by pulling on left-hand side of hand chain which releases the friction brake, and permits the load to descend smoothly.

The sleeve *B* runs on hardened and ground-steel rollers, everything is inclosed in a dust-proof case and runs in oil and a high efficiency is claimed for it. The retaining brake has two friction washers, one each side of the ratchet plate *F*, which revolves when load is being lifted, but is held by the pawl when the load is being lowered. This is made by the Climax Hoist Company, 1753 North Howard street, Philadelphia, Pennsylvania.





DETAILS OF THE CLIMAX HOIST

High-duty Vacuum Pump

The production of a perfect vacuum for commercial purposes has long been the wish of many mechanics, but the use of the mercurial air pump has been the only successful method used for exhausting air to the high degree as required in the manufacture of incandescent lamps and for laboratory use. The slowness of this operation, however, does not allow its general use in the arts. The accompanying illustration shows a belt-driven vacuum pump which is especially designed for this service and which is claimed to be capable of producing a perfect vacuum, and is located in the plant of the Westinghouse Electric Lamp Company, at Watsessing, N. J. The pump is of the two-stage pattern arranged with two 12-inch diameter vacuum cylinders, 12-inch stroke, designed for a speed of 100 revolutions per minute and under these conditions will produce a vacuum of within 0.02 inch of the barometric hight as registered by the mercury gage shown. This pump runs continuously under these conditions and the results obtained are very remarkable. The pump suction comes directly from a closed receiver which is piped off to the stands containing the incandescent lamps to be exhausted. The large capacity of the pump, together with its great efficiency, particularly adapts it for this class of service.

It works strictly on the dry system as no water is necessary or permitted to enter the cylinders. It is also adapted for

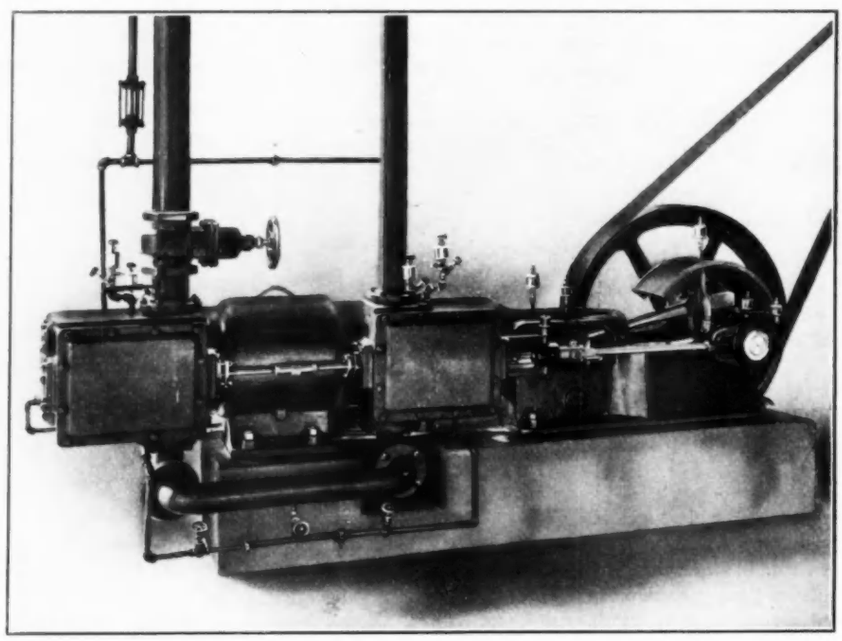


FIG. 1. HIGH-DUTY VACUUM PUMP

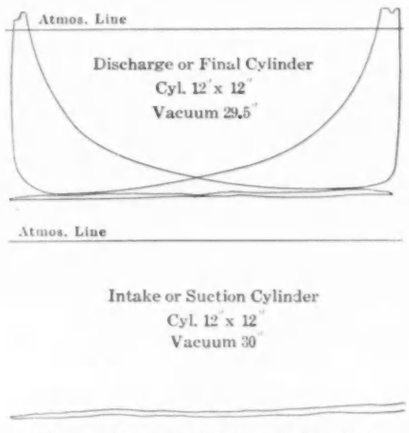


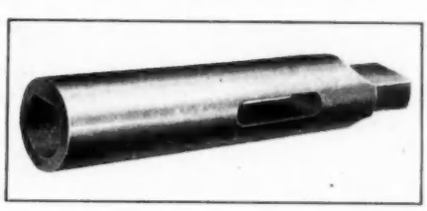
FIG. 2. CARDS FROM VACUUM PUMP

all usages where exceedingly high vacuum is desirable, namely, in connection with the evaporative processes of sugar refineries, distilling plants, chemical and dye works, glycerin preserving processes, the production of high vacuum in central steam-condensing systems, steam turbine work, etc. These vacuum pumps are also built with steam cylinders for direct steam drive, also arranged with extended bases and gearing for electric motor. The vacuum cylinders are thoroughly water-jacketed. The valves are mechanically operated by eccentrics keyed to the main shaft. By reducing the difference in pressure between the opposite sides of the piston, it is possible to take care of the leakage past the piston rings, etc., that may occur in the intake cylinder, which, however slight, seriously affects the capacity and efficiency of the pump on the higher ranges of vacuum, and in this way maintain a constant vacuum within 0.02 inch of the barometer.

We also illustrate a set of indicator cards taken from the two vacuum cylinders. It is interesting to note the difference in the work performed by the intake or suction cylinder and that of the final cylinder. The latter cylinder does by far the majority of the work, while the intake cylinder produces just that fraction of an inch of vacuum which reduces the resultant pressure to practically absolute zero. This machine is manufactured in larger and smaller sizes suitable for various capacities and is designed and patented by the Blake & Knowles Steam Pump Works, 115 Broadway, New York City.

The "Use-em-up" Drill Socket

This socket has been designed to enable drills which have had tangs twisted off or otherwise mutilated to be used during the rest of their natural life. All that is necessary is to grind a flat on one side of



DRILL SOCKET

the drill shank to fit the holder shown herewith and the drill is as good as before so far as work is concerned.

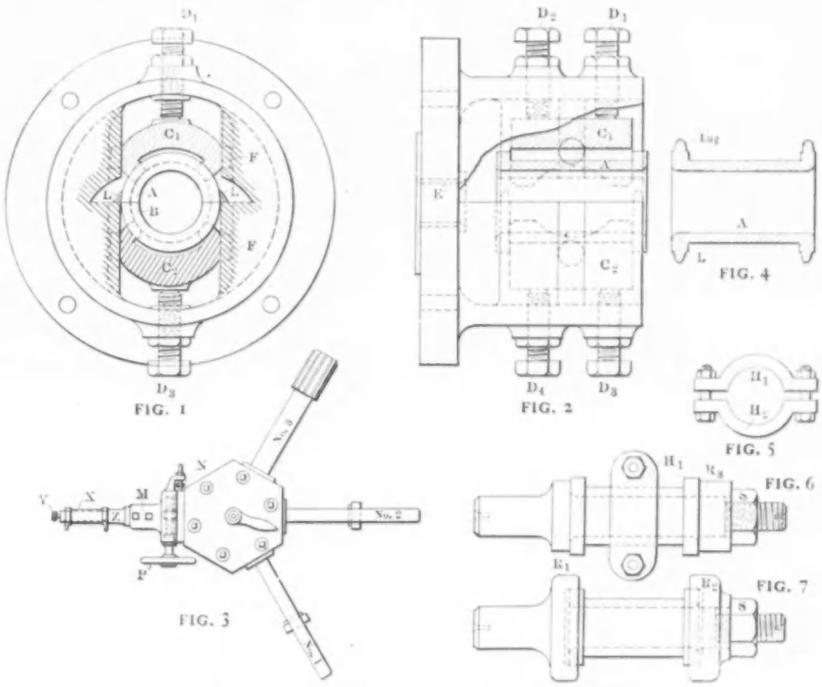
The manufacture of these is interesting as they simply cut off the piece, bore and ream it to size, swage the bore on a forming tool, chuck on a stud of the proper shape, center and turn to size and taper. The other operations are the same as with the regular socket except that the slot is longer to allow for forcing out drills with tangs entirely twisted off.

The width of the flats varies with the size from 5/16 inch for the No. 1 to 11/16 inch for the No. 4 and as this extends the whole length of the socket it enables drills having ¾ inch of shank left to be used. This is being made by the American Specialty Company, Harvey, Ill.

A Method of Making Engine Brasses

By R. Whaley

I have had nine years' experience on motor cars, and have tried and seen many methods of making brasses, including doing one-half at a time, and I find that turning a half hole is not as easy as it looks, for if the tool is a bit dull there is a nasty mark left at the first edge of the joint, and besides you are not able to ream.



AN ENGLISH METHOD OF MAKING ENGINE BRASSES

Now the greatest difficulty is in getting brasses perfectly divided, and the outside dead true with hole without having to solder the joint. I might say our troubles came to a head when our firm decided to use their bearing one half of solid brass, the other to be recessed and filled with anti-friction metal. This caused us to have to make one pair of brasses plain in the hole, then make the next pair recessed and filled with anti-friction metal, rebored, and then, one-half out of each pair taken to form a pair for use in engine. This caused a lot of trouble and led me to design the method described herewith, as by its use it is comparatively easy to produce an accurate, interchangeable, well finished job at a minimum cost without having to solder joint.

In the first place we must have a small locating lug cast on the corners of one-half brass, shown at *L*, Figs. 1, 2 and 4. These lugs are easily ground off on an emery wheel after boring is done, and being milled when making joint gives us exact center line of brasses right away.

The fixture in Figs. 1 and 2 is the jig used for boring and turning the brasses in front view and side view. The most important point in this jig is the face where the lugs *L* are resting as shown in Fig. 1; this face must be perfectly central and level with lathe.

Fig. 1 gives a front view showing a pair of brasses, *A* and *B*, fixed ready for boring. *A* is top half of brass with lugs shown at *L* and *B* is bottom half of brass resting in cradle. *C1* and *C2* are sliding cradles to hold and locate brasses, the cradles are kept in position lengthwise by turned pins *F* on the sides, these pins slide in grooves to resist pressure of tool when boring and reaming. *D1 D2 D3 D4* are screws for holding everything together, and should have lock nuts as shown, to guard against working loose.

Fig. 2 is a side view of jig with part cut away showing a section of top brass *A* and section of cradle *C1*, also the slots for pins of cradle to slide in. The jig is suitable for use either on ordinary lathe or turret, but was designed specially for use on turret lathes.

Having suitably mounted the jig on lathe spindle, we commence by grinding front end of brasses, so as to have a clean face for boring cutters. This little operation enables us to keep a good edge on cutters. Take brass *A* with lugs, place in jig with lugs resting on center face, bring down cradle *C1*, with screws *D1* and *D2*, and firmly fix brass down on center face.

Next place the lower half of brass *B* in cradle *C2*, and screw up to the joint firmly with screws *D3*, and *D4*, being careful not to force top brass off center face. Then tighten all screws well, lock with nuts and you are ready for boring hole and turning the ends of brasses.

Fig. 3 shows top view of turret, with special tools fixed. We rough-bore hole with boring bar No. 1, the front end of which is steadied by the hardened ground bush *E* Fig. 2. Next bore hole with bar No. 2, leaving about 0.005 inch in the hole for reamer. Then finish with reamer to size; maximum limit 0.001 inch. We now use the special fixture shown at *M* Fig. 3. With this arrangement, which we place inside the brasses just bored, we face up both ends of brasses, and radius the corners. The tools and bar are fixed firmly in the sliding socket *M*, which is worked by the screw and hand wheel *P*; the tools are fed down face by the hand wheel *P* to stop *N*. When bored and turned at ends, the brasses are ready to be taken from the jig for turning on the outside diameter.

Figs. 6 and 7 show arbors to be used for turning on the outside and may be used in either ordinary or turret lathe. They should be well made, hardened, and ground, and be a good fit in hole of brasses. At Fig. 6 the brass is seen ready for turning on the top and sides of flanges, clamps *H1* and *H2* being used to keep brasses together while turning, *R3* and *S* being nut and collar to tighten up with. Next at Fig. 7 we have the job ready for turning along body of brasses; being gripped by slight taper in collars *R1* and *R2*, these being forced by nut *S*. By this method we produce a most creditable job, without having to pick out our best workman.

The principle of casting lugs for locating center of joints can be used also on gear boxes, steering-post boxes, engine cases, and, in fact on any job where it is necessary to have the joint exactly in the center of the bore, the small lugs being easily taken off when the job is bored.

I should be pleased to supply speeds and times for this job for machining to anyone interested.

A business firm of Warsaw, Russia, writes to the Bureau of Manufactures that the Merchants' Association of that city "are contemplating to shortly establish, in a building specially provided for that purpose, a permanent exposition of articles and goods of all sorts manufactured beyond the limits of Russia, for the purpose of getting better acquainted with the foreign trade. The leading exporters and manufacturers of England, Austria, Hungary, Switzerland, Belgium, and France, have already expressed their desire to promote the foregoing plan." The letter states further that one of the members of the firm writing is an American citizen, who desired to acquaint the business concerns of the United States with this opportunity.

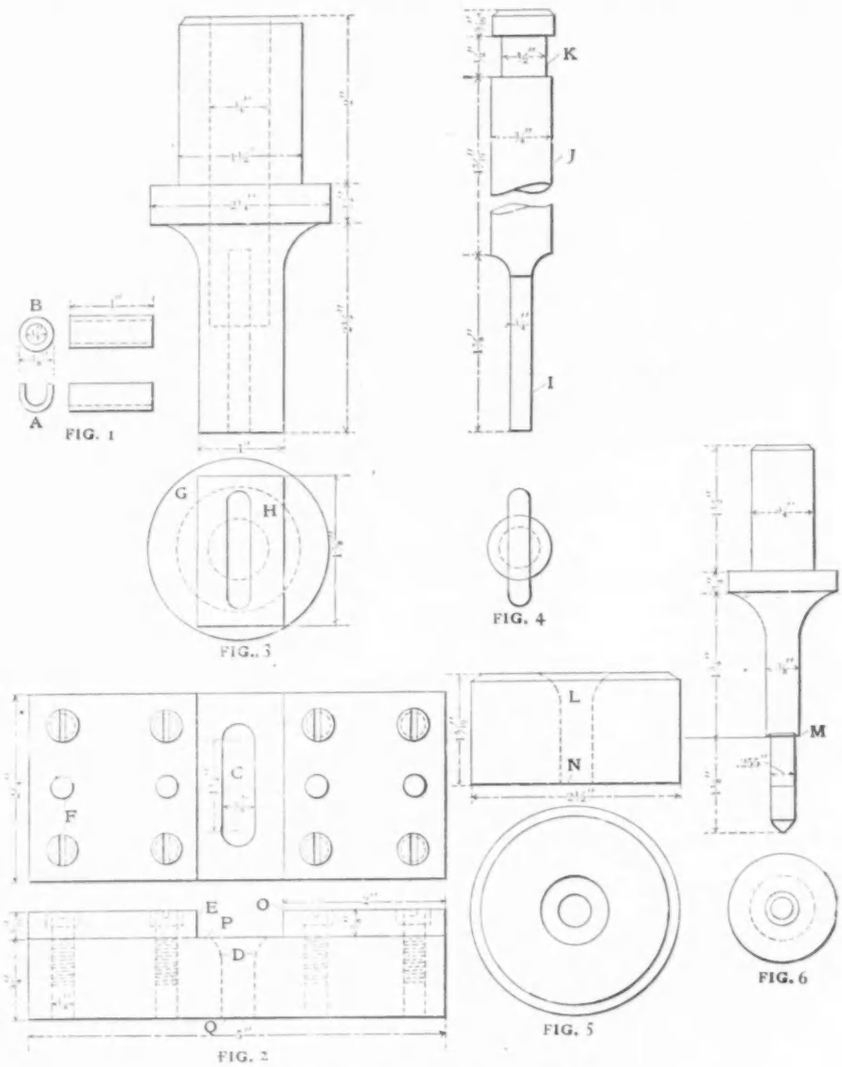
Press Tools for Making Short Tubes

By H. F. Allen

The sketches show a set of tools that came to my notice a short time ago for making a metal tube shown in Fig. 1. The outside diameter is ⅜ inch, the hole ¼ inch, the length 1 inch. The first operation is performed on a double-acting press, that cuts the blank and forms it into a V-shape, as shown at *A*. The second operation consists of closing the tube, as shown at *B*, Fig. 1. The stock used is 1/16 inch thick stripped to the desired width, 1 inch, and coiled in rolls, to be taken from reels to the die by means of roll feeds.

The tools for performing the first operation are shown in Figs. 2 and 3. The die is a piece of tool steel ¾ inch thick, 2¼ inches wide and 5 inches long, with a slot in the center ⅜ inch wide, 1¼ inches long, shown at *C*. The edges of this slot are rounded on both sides at *D* to allow for drawing to the U-shape. The cutting die is made in two pieces *E E* 5/16 inch thick, 2¼ inches wide, and 2 inches long. These two plates are fastened to the bottom plate by screws and dowels *F*, the cutting edges being ½ inch from the center of the slot. The three pieces are hardened and the bottom piece or forming die ground top and bottom; the cutting dies are also ground on top and bottom and on the cutting edges. The plates are then fastened to the forming die which is now ready for use.

The punch, Fig. 3, is next taken in hand. This consists of a piece of round tool steel 2¼ inches diameter, 5 inches long, with the shank turned 1½ inches to fit in the press, the collar on the punch being left full diameter. The cutting edge of the punch is shown in the plan view. The cutting edges *G* are fitted to the cutting edges of the die at *E*, Fig. 2, the width of the punch being 17⁄8 inches. The slot *H* is ¼ inch wide, the extreme length 1½ inches, the ends of the slot having a ⅛-inch radius, leaving the flat surface 1¼ inches long, which is longer than the blank. This gives an allowance in case the blank does not drop straight from the



PRESS TOOLS FOR MAKING SHORT TUBES

cutting operation, or if the stock does not feed exactly straight. This slot extends up into the punch a distance ⅛ inch greater than the drawing stroke of the press. The remaining length of the punch has a ¾-inch round hole bored through the shank and into the slot, to allow the forming punch, Fig. 4, to complete the downward stroke of the drawing plunger. The punch as shown has a flat end *I* fitting the slot in blanking punch *H*, Fig. 3; the round shank *J* fitting the ¾-inch hole in the punch and the groove *K* fitting the drawing plunger of the press.

The tools for the final operation, or the closing of the tube consists of the die, Fig. 5, made 2½ inches diameter and 1 5/16 inches thick. The hole *L* is ⅜ inch diameter, bell-mouthed to receive the tube after the first operation. The die is hardened and ground top and bottom, and the hole lapped to size and polished. The punch, Fig. 6, is made of 1¼-inch round tool steel and is 4⅜ inches long. The shank is turned ¾ inch to fit a single-acting press, the collar being left full size of the steel. The portion of the punch next the collar is turned ⅜ inch, or the size of the finished tube. The lower end of the punch is turned 0.255 inch to allow ¼-inch steel rod to pass through the work freely. The recess shown at *M* is turned in the punch to receive the edge of the tube. This recess holds the back of the tube close to the punch as it enters the finishing die.

The working of the tools is very satisfactory. The stock is taken from coils by the roll feed, and there is no scrap; nothing but the finished product comes from the press. The presses containing the first and second operations are set side by side, and one operator attends both. After placing a coil of stock on the reel and starting it in the roll feed, the press runs until the stock is run off, required from 35 to 45 minutes. While this work is being done the operator is seated at the other press performing the last operation.

In the first operation cutting and drawing into the U-form, if the feed is not accurate, the side *O* of the die, Fig. 2, which is higher than the opposite side allows the blank to strike against the edge and the rolls will slip. The punch descends, cuts the stock, and it drops on the surface *P* of the die, Fig. 2. The forming plunger descending draws the blank through the slot in the die, the edges *Q* shedding the blank which is now ready for the second operation. The operator takes the tube and places it on the punch, Fig. 6, the top edge being in recess *M*; the punch descending, the bell-mouthed hole in the die closes the tube around the lower end of the punch as the latter presses down through the die. The bottom edge *N* of the hole being very sharp, strips the tubes from the punch on the upward stroke.

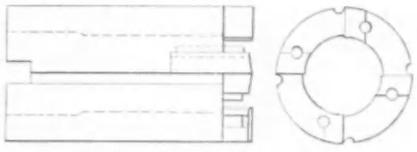
In my opinion the tools are a decided improvement over those now used extensively. Where the flat blank is curled around an arbor as in these tools the arbor is held rigid; in the other case the arbor is loose. Again, in the curling die the operator is obliged to strip the arbor of the tube, sometimes using a hammer. In the tools described, the die strips the blank.

Inserted Tooth Hollow Mill

By F. G. Wilson

The drawing illustrates a hollow mill for machining malleable castings, which device, after several months' trial, has proved itself superior to any other we have tried for doing this work.

The body is of machinery steel, case-



INSERTED TOOTH HOLLOW MILL

hardened. The inserted teeth are of high-speed steel and are retained in position by locking pins, as shown. After assembling, the clearance is ground on an internal grinder, at the same setting as the inside diameter of the mill. When broken or worn out, these cutters can be replaced at a small fraction of the cost of making the entire cutter of high-speed steel. The four grooves shown running lengthwise of the machinery-steel body are to admit soda water, and also to prevent chips from cutting either into the guide bushing in the jig, or the body of cutter.

Business Items

The Blaisdell Machinery Company, Bradford, Penn., has opened an office at 428 Monadnock, block, Chicago.

F. A. Welles, maker of calipers, has moved his business from Milwaukee to 627 Main street, Waukesha, Wis.

The Buffalo Foundry and Machine Company, Buffalo, N. Y., has opened a New York office at 143 Liberty street, in charge of H. E. Jacoby.

The Standard Roller Bearing Company of Philadelphia opened a branch office at 327 Jefferson Ave., Detroit, in charge of Ernest L. Smith, recently appointed western representative.

Trade Catalogs

The Cleveland Twist Drill Company, Cleveland, Ohio. Folder illustrating and describing "Perfect" double tang socket.

Roth Brothers and Company, Chicago, Ill. Bulletin No. 181, describing vertical shaft motors. Illustrated, 4 pages, 6x9 inches.

Greenfield Machine Company, Greenfield, Mass. Catalog No. 3, describing universal tool and cutter grinder. Illustrated, 56 pages, 6x9 inches, paper.

The Safety Emery Wheel Company, Springfield, Ohio. Catalog of grinding wheels and grinding machinery. Illustrated, 186 pages, 6x9 inches, paper.

Business Opportunities

The Echota Cotton Mills, Calhoun, Ga., is erecting plant.

The Fort Wayne (Ind.) Box Company will double its plant.

The Arlington (Tex.) Cotton Oil Company will erect a new gin.

The Christie Iron Works, New York, will erect a new factory.

The Windsor Spring Company, Kenosha, Wis., will enlarge its plant.

The Lawrence Stove Company, Buffalo, N. Y., will build a new factory.

The Crawford Locomotive Works, Streator, Ill., will enlarge its plant.

The Galax (Va.) Handle Works contemplates manufacturing baseball bats.

The Henderson (Ky.) Chair Company, recently incorporated, will erect factory.

The Jamestown (N. Y.) Metal Furniture Company will erect a new factory.

The Milto Box Company, Milwaukee, Wis., will double the capacity of its plant.

The Salt Lake & Ogden Railroad will build car and repair shops in Ogden, Utah.

The Roesch brewery, of La Grande, Ore., will be converted into a fruit cannery.

The Michigan Central Railroad will build two new roundhouses at Jackson, Mich.

J. D. Turner, of Corpus Christi, will erect an electric-light plant at Rockport, Texas.

The Wilson and Toomer Fertilizer Company, Jacksonville, Fla., will erect a bag factory.

Edward Stern and Company, Philadelphia, Penn., will build a new six-story printing plant.

Parrott and Crabtree, Kinston, N. C., will install machinery for making columns, newels, etc.

The Lewis Machine Company, Anniston, Ala., whose plant recently burned, will probably rebuild.

The Eagle Tanning Works, Whitehall, Mich., will erect a four-story addition to cost about $60,000.

The plant of the Dickson Car Wheel Company, Houston, Texas, was destroyed by fire. Loss $150,000.

The Imbler Wire Company, Alexandria, Ind., has reorganized and will erect a new factory building.

The Huntsville (Ala.) Canning Company, H. J. Newland, general manager, is building a factory.

The plant of the Gallipolis (Ohio) Foundry and Machine Company was destroyed by fire. Loss, $50,000.

Plans are being prepared for a four-story forge and foundry building for Pratt Institute, Brooklyn, N. Y.

The Chicago, Rock Island and Pacific Railway Company is having plans prepared for a roundhouse at Winnfield, La.

The Union Embossing Machine Company, Anderson, Ind., has awarded contract for the construction of a factory.

The Pfau Manufacturing Company, Cincinnati, purposes to erect a $50,000 factory building in Langdon avenue, Idlewood.

An addition to cost $8000 is being built to the machine shop of Fowler & Wolfe Manufacturing Company, Norristown, Penn.

The A. D. Orner Architectural and Wood Working Company, DuBois, Penn., is erecting a new factory which will double its capacity.

The Fred Rueping Leather Company, Milwaukee, Wis., will erect a new plant, which will give employment to 1000 men.

The Paxton and Vierling Iron Works Company, Omaha, Neb., has plans for a new building which will double the output of the plant.

The Goetz and Flodin Manufacturing Company, Chicago, Ill., contemplates the erection of a tank and machine shop to cost $150,000.

The boiler shop, coppersmith shop and storage room of the Bath (Me.) Iron Works was destroyed by fire on June 14, estimated damage $90,000.

The Louisville (Ky.) Woodstock Company, recently incorporated, will install a plant for the manufacture of poles, shafts, rims, buggy material, etc.

The Huntsville (Ala.) Canning Company has been organized with $15,000 capital stock. Directors, S. L. Cobb, J. H. Ballentine, Dr. J. P. Watts, etc.

The Belleville (Ill.) Baler Company has been incorporated to build a steel hay baler. Cyrus Thompson, W. A. Thompson and C. E. Wehrenberg, incorporators.

The Osborne Engineering Company, Cleveland, Ohio, is opening bids for a new factory and foundry building for the American Seeding Company, Springfield, Ohio.

The extensive plant of the American and British Manufacturing Company, Providence, R. I., was destroyed by fire on June 14, causing a loss to the plant, stock and machinery of over $150,000.

The Peerless Match Company, of Akron, O., has absorbed the Rockford Match and Machine Manufacturing Company, of Rockford, Ill., and a new plant is to be erected at Akron. The company will be capitalized at $150,000.

Sealed proposals will be received at the office of the Public Lighting Commission, 40 Atwater street, East, Detroit, Mich., until July 8 for the installation of an electrical generating plant in the station of the public lighting plant in accordance with specifications on file in the office of the commission.

The Isthmian Canal Commission, Washington, D. C., will receive bids up to 10:30 a.m., July 6 for condenser tubes, machine and key bolts, nuts, rivets, spring cotters, electric motors, steel trolleys, pump governers, steam gages, melting ladles, rail saws, lathe chuck, chisels, belt lacing as per Circular No. 448.

The Navy Department, Bureau of Supplies and Accounts, Washington, D. C., will open bids on the following dates: June 30, machine tools (schedule 1329); 22,335 pounds of tool steel (schedule 1337), pipe fittings (schedules 1327, 1329, 1335, 1338). July 7, exhaust fans (schedule 5), milling machine (schedule 9), steel tubing (schedule 1338).

Want Advertisements

Rate 25 cents a line for each insertion. About six words make a line. No advertisements abbreviated. Copy should be sent to reach us not later than Friday for ensuing week's issue. Answers addressed to our care will be forwarded. Applicants may specify names to which their replies are not to be forwarded but replies will not be returned. If not forwarded, they will be destroyed without notice. No information given by us regarding any advertiser using box number. Original letters of recommendation or other papers of value should not be inclosed to unknown correspondents. Only bona fide advertisements inserted under this heading. No advertising accepted from any agency, association or individual charging a fee for "registration," or a commission on wages of successful applicants for situations.

Miscellaneous Wants

Caliper list free. E. G. Smith Co., Columbia, Pa.

If you use small gears in large quantities, write Berry & Parker, Erie, Pa.

Steel case hardened; modern methods. Boston Gear Works, Norfolk Downs, Mass.

We buy or pay royalty for good patented machine or tool. Box 282, AMER. MACH.

Hand power bending tools, labor-saving, money-making. Estep & Dolan, Sandwich, Ill.

Light, fine machinery to order; models and electrical work specialty. E. O. Chase, Newark, N. J.

Wanted—Maker's name and address of machine for making wool mattresses in layers. Box 239, AMERICAN MACHINIST.

Special machinery accurately built. Screw machine and turret lathe work solicited. Robert J. Emory & Co., Newark, N. J.

Wanted—1 old style No. 13 B. & S. milling machine. First-class condition not absolutely necessary. Box 234, AMERICAN MACHINIST.

Wanted—Machinery or machine parts to build by contract. Ideas developed; drawings made. Address "A," care AMERICAN MACHINIST.

We are equipped to turn out twice the number of gears used on our own work, can we do yours to fill in? Samuel L. Langston, Camden, N. J.

"Acme Automatic" users who wish to do left hand threading without attachments address R. H. Victory, 78 Mt. Vernon St., Lowell, Mass.

Wanted—Foundry and machine shop want orders for brass castings in quantities; also speed and monitor lathe work. Box 182, AMERICAN MACHINIST.

Special machinery and duplicate machine parts built to order; tools, jigs and experimental work; complete modern equipment. MacCordy Mfg. Co., Amsterdam, N. Y.

Have you a March 7, 1907 issue AMERICAN MACHINIST? We'll give you a month's subscription, or thirty cents, and a Steel supplement for it. AMERICAN MACHINIST, 505 Pearl street, New York.

A large English firm of machine-tool importers having showrooms and offices in Great Britain, France, Italy and Japan, is wanting good agencies for machine tools of all kinds. Apply Box 189, AMERICAN MACHINIST.

Machinists take notice. Purchase castings and blueprints of high-grade gasolene motor, of world-wide reputation and at a profitable business. Write today. F. P. Conrad, 242 Freeport St., Harrison Sq., Boston.

Machinery built to order and by contract; special parts made; gear cutting, automobile and pattern work, punch press and screw machine work, tools, dies, etc. Blair Tool and Machine Works, West and Morris Sts., New York City.

New Patent Articles Wanted—Inventors and manufacturers having patented novelties may secure immediate European market. We buy foreign patents for cash or manufacture on royalty. Also buy the goods for cash only. The principal member of important European business house is now in the United States. He will consider any meritorious articles that are perfected and ready for sale. New York bank references will be given. Only serious propositions will be entertained and all communications will be treated confidentially. We guarantee quick action. Do not reply unless prepared for full investigation. Address "Success," Box 314, Madison Square, New York City.

Situations Wanted

Classification indicates present address of advertiser, nothing else.

CONNECTICUT

Superintendency wanted by high-grade man up on costs and production. Box 220, AM. MACH.

ILLINOIS

Up-to-date tool room foreman desires change; experienced on design and construction of sub-press dies, and tools for manufacturing adding machines, cash registers and small arms. Age 30. Married. References furnished. Box 241, AMERICAN MACHINIST.

MASSACHUSETTS

Designer and inventor of special and automatic machinery. Best of references. Box 230, AMERICAN MACHINIST.

NEW JERSEY

Mechanical draftsman wishes position. Box 232, AMERICAN MACHINIST.

Practical mechanic wants position as toolroom or general machine-shop foreman; long experience as executive and good designer of tools and labor-saving devices. Box 218, AM. MACH.

Technical graduate (27), married, desires position as assistant to superintendent of shop making small metal specialties. Has six years' shop and drafting room experience. Box 246, AMERICAN MACHINIST.

Factory manager, good executive with excellent record for developing loyal and efficient organization. Can show results in cutting costs. Has had no labor troubles excepting one strike, on which he won out. Box 244, AMERICAN MACHINIST.

Purchasing agent, successful executive, conscientious worker, buys at right prices, secures delivery at proper time, will not "stand for graft." Experienced in buying for large plants raw material, machinery and miscellaneous supplies. Box 243, AMERICAN MACHINIST.

NEW YORK

Position as superintendent with a concern whose business will pay a salary of $300 per month to a man who can show results and reduce costs. Box 199 AMERICAN MACHINIST.

By mechanical and electrical engineer, college graduate (1885), with wide experience on hoisting machinery, pumps and electric motors; familiar with modern shop methods; received gold medal at international exhibition. Box 247, AM. MACH.

Mechanical engineer, with extended experience in steam and general engineering lines, including design, manufacture and installation, steam, electric and handling machinery, power plant equipment, etc., desires to make new engineering engagement. Box 245, AM. MACH.

PENNSYLVANIA

Technical graduate, first-class designer on steam engines, marine and stationary, rolling mill engines, blowing engines, air compressors and pneumatic tools, desires to change. Has two years' practical shop experience, three months in laboratory and testing of materials and eight years as designer and draftsman. First-class references furnished as to ability and skill. Reply to Box 248, AMERICAN MACHINIST.

WISCONSIN

Superintendent or works manager desires a change, entire charge. Extensive experience Gas, Gasolene and Producer Engines, right up-to-date, a hustler with a clean record. A-1 reference. Box 250 AMERICAN MACHINIST.

Help Wanted

Classification indicates present address of advertiser, nothing else.

INDIANA

Wanted—By an old and firmly established manufacturing concern, a thoroughly qualified man to take entire responsibility of tool department employing 20 to 30 hands. There must be no question as to ability to produce all characters of our tools at costs in keeping with degree of refinement, which varies from the highest character of small interchangeable tools to tools for rough, coarse work. The position is permanent to the right man and larger possibilities are before him. State age, references and salary. Box 238, AMER. MACH.

MASSACHUSETTS

Wanted—An assistant superintendent for a factory employing 300 men, manufacturing small tools; age 30 to 40 years. A good man with lots of ambition, even though he has not had experience as a superintendent, would be tried. Box 242, AMERICAN MACHINIST.

MICHIGAN

Sales manager wanted; competent to take charge of selling end of a young growing marine engine and machine business, must invest from $3,000 to $5,000. Address Box 251 AM. MACH.

NEW JERSEY

Wanted—First-class toolmaker, who has had experience with Gridley, Brown & Sharpe and other automatic screw machines, and capable of handling men on fine work. Only those of broad experience need answer. Box 249, AMERICAN MACHINIST.

Wanted—A machine-tool designer; one who can lead a small force of men. Must have had practical experience along a line of medium heavy work. Quick to comprehend and thoroughly familiar with detail work. Salary $30 per week. Permanent position. Box 237, AMERICAN MACHINIST.

NEW YORK

Wanted—Instrument makers, experienced in calibration of automobile speed indicators. Liberal wages to first-class men. Box 236, AMERICAN MACHINIST.

Wanted—As an assistant foreman, a first-class tool maker who has had experience on building machinery and small tool work. Box 224, AMERICAN MACHINIST.

Wanted—Draftsman, designer and practical machinist to design attaching fittings for automobile speed indicators. Good salary paid to right man. None other than experienced

high-grade man need apply. State references and experience. Box 235, AMERICAN MACHINIST.

OHIO

Wanted—Superintendent and designer of screw machines and turret machinery. Box 217, AMERICAN MACHINIST.

PENNSYLVANIA

Wanted—Salesmen (traveling or local) selling the machinery or supply trade or consumers. Challenge Machine Co., Inc., Philadelphia, Pa.

Wanted—Designer and draftsman familiar with machine and furnace construction. State age, experience, references and salary desired. Box 240, AMERICAN MACHINIST.

Wanted—Two men thoroughly experienced in the hobbing of pipe threading dies, also familiar with the various complications of high cutting speeds. None but first-class men need apply. Highest wages paid. Box 216, AMERICAN MACH.

Wanted—An instructor as general assistant in mechanical engineering. Salary $1200, including work of summer term. Should be a graduate of three years' standing from some high-grade technical college and have at least two years' practical experience outside of college. State college record, equipment for teaching and give references; address professor of Mechanical Engineering, Lehigh University, South Bethlehem, Pa.

WISCONSIN

Wanted—Six good machinists for making jigs and fixtures for automobile parts. Want one of them capable of taking charge. Open shop. Thomas B. Jeffrey & Co., Kenosha, Wis.

For Sale

For Sale—One second-hand Uehling Steinbart & Company pneumatic pyrometer complete, with recording gage. Box 140, AMERICAN MACHINIST.

For Sale—One Morse & Dexter valve reseating machine, brand new and complete, ¼" to 9", cost $190, will sell for $60. E. E. Daniels, 4735 Cottage Ave., St. Louis.

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Belt Fasteners
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Belt Filler
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Belt Lacing Machine
Birdsboro Steel Foundry & Mach. Co., Birdsboro, Pa.

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New Haven Mfg. Co., New Haven, Conn.
Newton Mach. Tool Works, Inc., Philadelphia, Pa.
Niles-Bement-Pond Co., New York.
Prentiss Tool & Supply Co., New York.
Rockford Drilling Mach. Co., Rockford, Ill.
Sellers & Co., Inc., Wm., Philadelphia, Pa.
Vandyck Churchill Co., New York.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.

Boring and Turning Mills, Vertical
American Tool Works Co., Cin., O.
Baker Bros., Toledo, O.
Baush Mach. Tool Co., Springfield, Mass
Betts Mach. Co., Wilmington, Del.
Bullard Mach. Tool Co., Bridgeport, Conn.
Colburn Mach. Tool Co., Franklin, Pa.
Gisholt Mach. Co., Madison, Wis.
Harrington, Son & Co., Edwin, Philadelphia, Pa.
McCabe, J. J., New York.
Mitts & Merrill, Saginaw, Mich.
Newton Machine Tool Wks., Inc., Phila., Pa.
Niles-Bement-Pond Co., New York.
Prentiss Tool & Supply Co., New York.
Sellers & Co., Inc., Philadelphia, Pa.
Vandyck Churchill Co., New York.

Boring Tools
Armstrong Bros. Tool Co., Chicago, Ill.
Krieger Tool & Mfg. Co., Chicago Ill.

Boxes, Tote
Lyon Metallic Mfg. Co., Aurora, Ill.

Box Tools, Roughing
Bardons & Oliver, Cleveland, O

Brazing
Industrial Oxygen Co., New York.

Broaching Machines
Harrington, Son & Co., Edwin, Philadelphia, Pa.
Hill, Clarke & Co., Inc., Boston, Mass.
Lapointe Mach. Tool Co., Hudson, Mass.

Bulldozers
Bliss Co., E. W., Brooklyn, N. Y.
National Machinery Co., Tiffin, O.
Niles-Bement-Pond Co., New York.
Prentiss Tool & Supply Co., New York.

Cabinets, Tool
Armstrong Bros. Tool Co., Chicago, Ill.
Hammacher, Schlemmer & Co., New York.
Lyon Metallic Mfg. Co., Aurora, Ill.
Morse Twist Drill & Mach. Co., New Bedford, Mass.

Calipers
Brown & Sharpe Mfg. Co., Providence, R. I.
Morse Twist Drill & Mach. Co., New Bedford, Mass
Slocomb Co., J. T., Providence, R. I.
Starrett Co., L. S., Athol, Mass.

Cams
Bilgram, Hugo, Phila., Pa.
Boston Gear Works, Norfolk Downs, Mass.

Carborundum
See Grinding Wheels.

Carborundum Paper and Cloth
Carborundum Co., Niagara Falls, N. Y.

Case-Hardening
American Gas Furnace Co., New York.
Rogers & Hubbard Co., Middletown, Conn.
Williams & Co., J. H., Brooklyn, N. Y.

Castings, Brass and Bronze
Clum & Atkinson, Rochester, N. Y.
Lumen Bearing Co., Buffalo, N. Y.

Castings, Die Molded
Berry & Parker, Erie, Pa.
Franklin Mfg. Co., H. H., Syracuse, N. Y.

Castings, Iron
Birdsboro Steel Frdy. & Mach. Co., Birdsboro, Pa.
Cell Drier Machine Co., Taunton, Mass.
Farrel Fdry. & Mach. Co., Ansonia, Conn.
Taylor & Fenn Co., Hartford, Ct.

Castings, Steel
Birdsboro Steel Fdry. & Mach Co., Birdsboro, Mass.
Cammel, Laird & Co., New York.

Cast Iron Brazing
Industrial Oxygen Co., New York.

Cement, Cast Steel
Clark Cast Steel Cement Co., Shelton, Conn.
Obermayer & Co., S., Cincinnati, O.

Centering Machines
Hendey Mach. Co., Torrington, Conn.
McCabe, J. J., New York.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Hartford, Conn.
Prentiss Tool & Supply Co., New York.
Whiton Mach. Co., D. E., New London, Conn.

Centers, Planer
Fay & Scott, Dexter, Me.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
New Haven Mfg. Co., New Haven, Conn.
Pratt & Whitney Co., Hartford, Conn.
Woodward & Powell Planer Co., Worcester, Mass.

Chains, Driving
Boston Gear Works, Norfolk Downs, Mass.
Diamond Chain & Mfg. Co., Indianapolis, Ind.
Link-Belt Co., Philadelphia, Pa.
Morse Chain Co., Ithaca, N. Y.
Whitney Mfg. Co., Hartford, Conn

Chucking Machines
American Tool Wks. Co., Cin., O.
Bardons & Oliver, Cleveland, O.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Automatic Machine Co., Cleveland, O.
Gisholt Mach. Co., Madison, Wis.
LeBlond Mach. Tool Co., R. K., Cincinnati, O.
McCabe, J. J., New York.
Reed Co., F. E., Worcester, Mass.
Warner & Swasey Co., Cleveland, Ohio.
Whitcomb-Blaisdell Machine Tool Co., Worcester, Mass.

Chucks, Drill
Almond Mfg. Co., T. R., Brooklyn, N. Y.
Brown & Co., R. H., New Haven, Conn.
Celfor Tool Co., Chicago, Ill.
Cleveland Twist Drill Co., Cleveland, O.
Cushman Chuck Co., Hartford, Conn.
Grönkvist Drill Chuck Co., Jersey City, N. J.
Horton & Son Co., E., Windsor Locks, Conn.
Jacobs Mfg. Co., Hartford, Conn.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt Chuck Co., Frankfort, N. Y.
Skinner Chuck Co., New Britain, Conn

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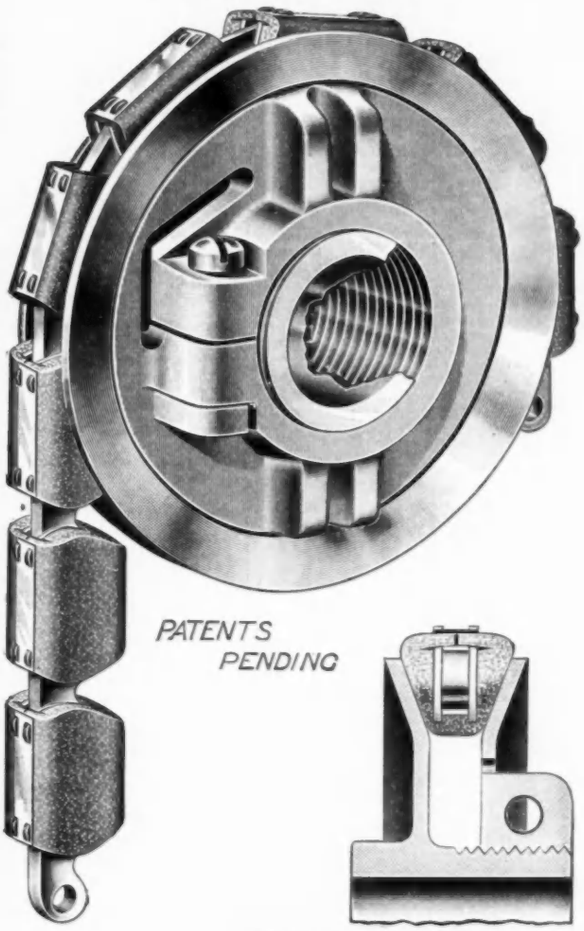
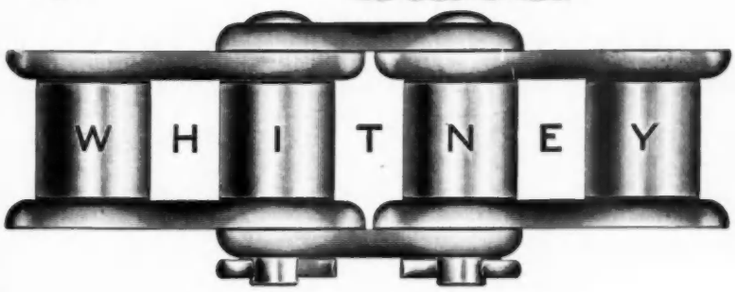
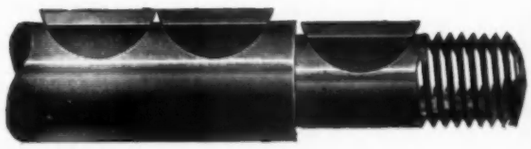
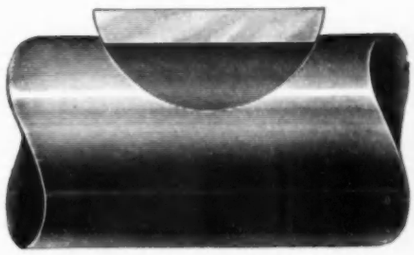


PATENTS PENDING







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By C F. Wyckoff, President.

THE WHITNEY MFG. COMPANY, Hartford, Conn.

Chucks, Drill—*Continued.*

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Trump Bros. Mach. Co., Wilmington, Del.
Whitman & Barnes Mfg. Co., Chicago, Ill.
Whitney Mfg. Co., Hartford, Conn.
Whiton Mach. Co., D. E., New London, Conn.
Wiley & Russell Mfg. Co., Greenfield, Mass.

Chucks, Lathe

Cincinnati Chuck Co., Cincinnati, O.
Cushman Chuck Co., Hartford, Conn.
Gisholt Mach. Co., Madison, Wis.
Hoggson & Pettis Mfg. Co., New Haven, Conn.
Horton & Son Co., E., Windsor Locks, Conn.
Niles-Bement-Pond Co., New York.
Pratt Chuck Co., Frankfort, N. Y.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Whiton Mach. Co., D. E., New London, Conn.

Chucks, Planer

Harrington & Son Co., Edwin, Philadelphia, Pa.
New Haven Mfg. Co., New Haven, Conn.
Niles-Bement-Pond Co., New York.
Skinner Chuck Co., New Britain, Conn.

Chucks, Split

Hardinge Bros., Chicago, Ill.
Rivett Lathe Mfg. Co., Boston, Mass.
Sloan & Chace Mfg. Co., Ltd., Newark, N. J.

Circuit Breakers

Crocker-Wheeler Co., Ampere, N. J
General Electric Co., New York.
Western Electric Co., Chicago, Ill.
Westinghouse Electric & Mfg. Co., Pittsburg, Pa.

Clamps

Hammacher, Schlemmer & Co., New York.
Hoggson & Pettis Mfg. Co., New Haven, Conn.
Starrett Co., L. S., Athol, Mass.
Tudor Mfg. Co., Taunton, Mass.
Williams & Co., J. H., Brooklyn, N. Y.

Clocks, Watchman's

Hardinge Bros., Chicago, Ill.

Clutches, Friction

Bliss Co., E. W., Brooklyn, N. Y.
Caldwell, Son & Co., W. H., Chicago, Ill.
Eastern Machinery Co., New Haven, Conn.
Evans Friction Cone Co., Newton Centre, Mass.
Farrel Fdry. & Mach. Co., Ansonia, Conn.
Johnson Mach. Co., Carlyle, Hartford, Conn.
Link-Belt Co., Philadelphia, Pa.
New Haven Mfg. Co., New Haven, Conn.
Niles-Bement-Pond Co., New York.
Williams Foundry & Machine Co., Akron, Ohio.

Coal Handling Machinery

Link-Belt Co., Philadelphia, Pa.

Compound, Core

Obermayer Co., S., Cincinnati, O.

Compound, Pipe Joint

Dixon Crucible Co., Joseph, Jersey City, N. J.

Compressors, Air

Blaisdell Machinery Co., Bradford, Pa.
Blanchard Machine Co., Cambridge, Mass.
Bury Compressor Co., Erie, Pa.
Clayton Air Compressor Works, New York.
Independent Pneumatic Tool Co., Chicago, Ill.
Ingersoll-Rand Co., New York.
Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.
Spacke Machine Co., F. W., Indianapolis, Ind.

Compressors, Gas

Blaisdell Machinery Co., Bradford, Pa.
Ingersoll-Rand Co., New York.

Cones, Friction

Evans Friction Cone Co., Newton Centre, Mass.

Connecting Rods and Straps

Standard Connecting Rod Co., Beaver Falls, Pa.
Tindel-Morris Co., Eddystone, Pa.

Contract Work

Blanchard Mach. Co., Cambridge, Mass.
Cell Drier Mach. Co., Taunton, Mass.
Farrel Fdry. & Mach. Co., Ansonia, Conn.
Manville Bros. Co., Waterbury, Conn.
Merritt, Jos., Hartford, Conn.
Turner Mach. Co., Danbury, Conn.

Controllers and Starters, Electric Motor

Crocker-Wheeler Co., Ampere, N. J.
General Electric Co., New York.
Westinghouse Electric & Mfg. Co., Pittsburg, Pa.

Conveyors, Automatic

Lamson Consolidated Store Service Co., Boston, Mass.
Link-Belt Co., Philadelphia, Pa.

Coping Machines

Long & Allstatter Co., Hamilton, Ohio.
Niles-Bement-Pond Co., New York.

Corundum

See Grinding Wheels.

Cotters

Cleveland Twist Drill Co., Cleveland, Ohio.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Standard Tool Co., Cleveland, O.
Whitman & Barnes Mfg. Co., Chicago, Ill.

Counterbores

Cleveland Twist Drill Co., Cleveland, Ohio.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Slocomb Co., J. T., Prov., R. I.
Starrett Co., L. S., Athol, Mass.

Counters, Revolution

Root Co., C. J., Bristol, Conn.
Schuchardt & Schutte, New York.
Veeder Mfg. Co., Hartford, Conn.

Countershafts

Almond Mfg. Co., T. R., Brooklyn, N. Y.
Builders Iron Foundry, Providence, R. I.
Coates Clipper Mfg. Co., Worcester, Mass.
Evans Friction Cone Co., Newton Centre, Mass.
LeBlond Mach. Tool Co., R. K., Cincinnati, O.
McCabe, J. J., New York.
Mossberg Wrench Co., Central Falls, R. I.
Norton Grinding Co., Worcester, Mass.
Safety Emery Wheel Co., Springfield, O.
Smith Countershaft Co., Boston, Mass.

Countershafts, Friction

Evans Friction Cone Co., Newton Centre, Mass.
Wilmarth & Morman Co., Grand Rapids, Mich.

Countershafts, Speed Changing

Evans Friction Cone Co., Newton Centre, Mass.
Gisholt Mach. Co., Madison, Wis.

Counting and Printing Wheels

Franklin Mfg. Co., H. H., Syracuse, N. Y.

Couplers, Hose

Independent Pneu. Tool Co., Chicago, Ill.
Ingersoll-Rand Co., New York.

Couplings

Almond Mfg. Co., T. R., Brooklyn, N. Y.
Caldwell & Son Co., H. W., Chicago, Ill.
Davis Machine Co., W. P., Rochester, N. Y.
Link-Belt Co., Philadelphia, Pa.
Nicholson & Co., W. H., Wilkes-Barre, Pa.

Couplings—*Continued.*

Niles-Bement-Pond Co., New York.
Sellers & Co., Inc., Wm., Philadelphia, Pa.
Standard Gauge Steel Co., Beaver Falls, Pa.
Williams Fdry. & Mach. Co., Akron, Ohio.

Cranes

Brown Hoisting Mach. Co., Cleveland, O.
Case Mfg. Co., Columbus, O.
Cleveland Crane & Car Co., Wickliffe, O.
Crescent Forgings Co., Oakmont, Pa.
Franklin Port. Crane and Hoist Co., Franklin, Pa.
Manning, Maxwell & Moore, Inc., New York.
Maris Bros., Philadelphia, Pa.
Nicholls, Wm. S., New York.
Niles-Bement-Pond Co., New York.
Northern Engineering Works, Detroit, Mich.
Obermayer Co., S., Cincinnati, O.
Pawling & Harnischfeger, Milwaukee, Wis.
Sellers & Co., Inc., Wm., Philadelphia, Pa.
Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.
Vandyck Churchill Co., New York.
Yale & Towne Mfg. Co., New York.

Crank Pin Turning Machines

Niles-Bement-Pond Co., New York.
Underwood & Co., H. B., Philadelphia, Pa.

Crank Shafts

Standard Connecting Rod Co., Beaver Falls, Pa.
Tindel-Morris Co., Eddystone, Pa.

Crucibles

Dixon Crucible Co., Joseph, Jersey City, N. J.
Obermayer Co., S., Cincinnati, O.

Crushers

Farrel Fdry. & Mach. Co., Ansonia, Conn.
Niles-Bement-Pond Co., New York.
Link-Belt Co., Philadelphia, Pa.

Cupolas, and Ladles, Foundry

Obermayer Co., S., Cincinnati, O.
Paxson Co., J. W., Phila., Pa.
Stevens, F. B., Detroit, Mich.

Cups, Grease

Lunkenheimer Co., Cincinnati, O.

Cutters, Milling

Adams Co., Dubuque, Iowa.
Becker-Brainard Milling Machine Co., Hyde Park, Mass.
Bliss Mfg. Co., E. C., Providence, R. I.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Twist Drill Co., Cleveland, O.
Hardinge Bros., Chicago, Ill.
Harrison & Knight Mfg. Co., Newark, N. J.
Ingersoll Milling Mach. Co., Rockford, Ill.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Co., Hartford, Conn.
Rogers Works, Jno. M.; Gloucester City, N. J.
Sloan & Chace Mfg. Co., Ltd., Newark, N. J.
Standard Tool Co., Cleveland, O.
Union Twist Drill Co., Athol, Mass.
Ward & Son, Edgar T., Boston, Mass.
Whitney Mfg. Co., Hartford, Ct.

Cutting-off Machines

Armstrong Bros. Tool Co., Chicago, Ill.
Bignall & Keeler Mfg. Co., Edwardsville, Ill.
Brown & Sharpe Mfg. Co, Providence, R. I.
Davis Machine Co., W. P., Rochester, N. Y.
Hurlburt-Rogers Mach. Co., South Sudbury, Mass.
McCabe, J. J., New York.
Newton Mach. Tool Wks., Inc., Philadelphia, Pa.
Pratt & Whitney Co, Hartford, Conn.
Prentiss Tool & Supply Co., New York.
Schmitz, August, Dusseldorf, Germany.
Tindel-Morris Co., Eddystone, Pa.
Vandyck Churchill Co., New York.

Cutting-off Tools

Armstrong Bros. Tool Co., Chicago, Ill.
Billings & Spencer Co., Hartford, Conn.
Cleveland Twist Drill Co., Cleveland, O.
Fitchburg Machine Works, Fitchburg, Mass.
Krieger Tool & Mfg. Co., Chicago, Ill.
O. K. Tool Holder Co., Shelton, Conn.
Pratt & Whitney Co., Hartford, Conn.

Diamond Tools

American Emery Wheel Co., Providence, R. I.
Dickinson, Thos. L., New York.
Safety Emery Wheel Co., Springfield, O.

Dies, Sheet Metal

American Tube & Stamping Co., Bridgeport, Conn.
Bliss Co., E. W., Brooklyn, N. Y.
Consolidated Press and Tool Co., Hastings, Mich.
Ferracute Mach. Co., Bridgeton, N. J.
Globe Machine & Stamping Co., Cleveland, O.
Manville Bros. Co., Waterbury, Conn.

Dies, Sub-Press

Sloan & Chace Mfg. Co., Newark, N. J.
Waltham Machine Works, Waltham, Mass.

Dies, Threading, Opening

Errington, F. A., New York.
Foote-Burt Co., Cleveland, O.
Geometric Tool Co., New Haven, Conn.
Jones & Lamson Machine Co., Springfield, Vt.
Pratt & Whitney Co., Hartford, Conn.

Drawing Boards and Tables

Alteneder & Son, Theo., Philadelphia, Pa.
Kolesch & Co., New York.

Drawing Materials

Alteneder & Son, Theo., Philadelphia, Pa.
Kolesch & Co., New York.
Technical Supply Co Scranton, Pa.

Drafting Machines

Universal Drafting Mach. Co., Cleveland, O.

Drilling Machines, Bench

American Watch Tool Co., Waltham, Mass.
Barnes Co., W. F. & John, Rockford Ill.
Boynton & Plummer. Worcester, Mass.
Ingersoll-Rand Co., New York.
Pratt & Whitney Co., Hartford, Conn.
Prentice Bros. Co., Worcester, Mass.
Rockford Drilling Mach. Co., Rockford, Ill.
Slate Machine Co., Dwight, Hartford, Conn.
Sloan & Chace Mfg. Co., Ltd., Newark, N. J.
U. S. Electrical Tool Co., Cincinnati, O.

Drilling Machines, Boiler

American Tool Works Co., Cin., O.
Bickford Drill & Tool Co., Cincinnati, O.
Boynton & Plummer, Worcester, Mass.
Foote-Burt Co., The, Cleveland, O.
Ingersoll-Rand Co., New York.
McCabe, J. J., New York.
Niles-Bement-Pond Co., New York.
Prentice Bros. Co., Worcester, Mass.

Drilling Machines, Multiple Spindle

American Tool Wks. Co., Cin., O.
Baker Bros., Toledo, O.
Barnes Co., W. F. & John, Rockford, Ill.
Baush Mach. Tool Co., Springfield, Mass.
Bickford Drill & Tool Co., Cincinnati, O.
Flather Planer Co., Mark, Nashua, N. H.
Foote-Burt Co., The, Cleveland, Ohio.
Fosdick Mach. Tool Co., Cin., O.

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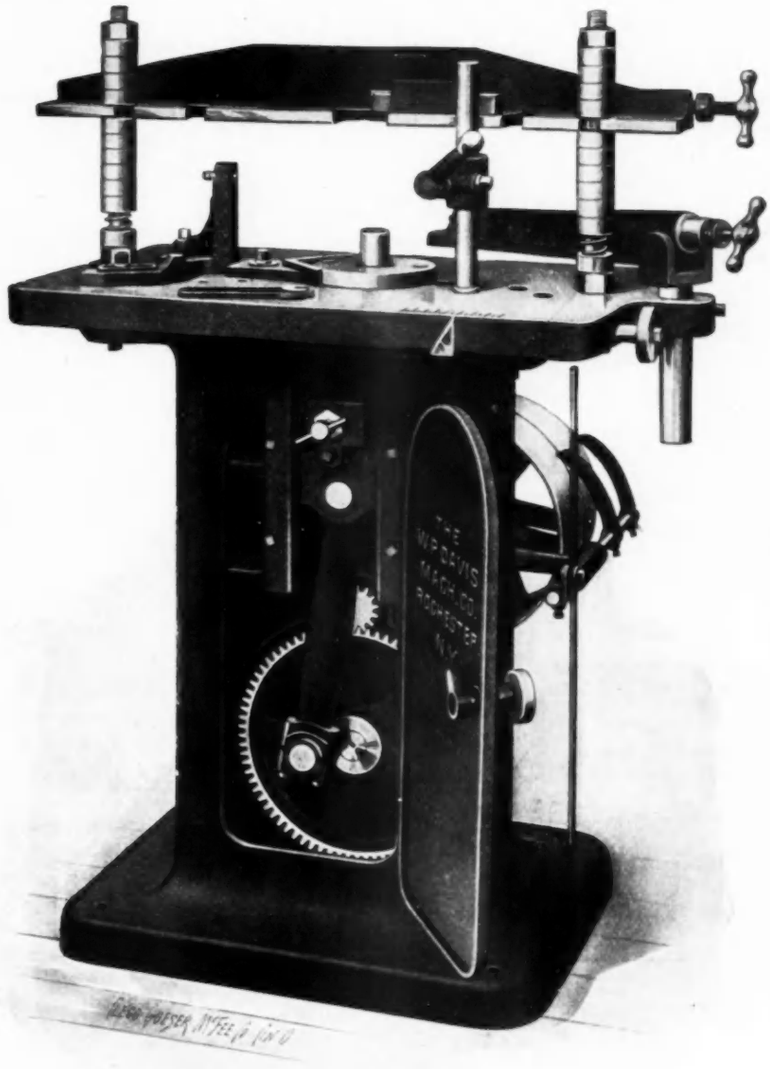

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Harrington Son & Co., Edwin, Philadelphia, Pa.
Henry & Wright Mfg. Co., Hartford, Conn.
Hill, Clarke & Co., Inc., Boston, Mass.
Marshall & Huschardt Machry. Co., Chicago, Ill.
McCabe, J. J., New York.
Newton Mach. Tool Works, Inc., Philadelphia, Pa.
Niles-Bement-Pond Co., New York
Prentice Bros. Co., Worcester, Mass.
Prentiss Tool & Supply Co., New York.
Rockford Drilling Mach. Co., Rockford, Ill
Sellers & Co., Inc., Wm., Philadelphia, Pa.
Slate Machine Co., Dwight, Hartford, Conn.
Taylor & Fenn Co., Hartford, Conn.

Drilling Machines, Portable

Cincinnati Elec. Tool Co., Cin., O.
Clark, Jr., Elec. Co., Inc., James, Louisville, Ky.
Coates Clipper Mfg. Co., Worcester, Mass.
Gem Mfg. Co., Pittsburg, Pa.
Hisey-Wolf Mach. Co., Cin., O.
Ingersoll-Rand Co., New York.
Newton Machine Tool Wks., Inc., Phila., Pa.
Niles-Bement-Pond Co., New York.
U. S. Electrical Tool Co., Cincinnati, O.

Drilling Machines, Radial

American Tool Works Co., Cin., O.
Baush Mach. Tool Co., Springfield, Mass.
Bickford Drill & Tool Co., Cincinnati, O
Dreses Mach. Tool Co., Cin., O.
Fitchburg Machine Works, Fitchburg, Mass.
Foote-Burt Co., Cleveland, O
Fosdick Mach. Tool Co., Cin., O.
Gang Co., Wm. E., Cincinnati, O.
Harrington, Son & Co., Edwin, Philadelphia, Pa.
Kilbert Mach. Co., Cincinnati, Ohio.
Marshall & Huschart Machry. Co., Chicago, Ill.
McCabe, J. J., New York.
Morris Foundry Co., Jno. B., Cincinnati, O.
Mueller Mach. Tool Co., Cin., O.
Newton Machine Tool Wks., Inc., Phila., Pa.
Niles-Bement-Pond Co., New York.
Prentice Bros. Co, Worcester, Mass.
Prentiss Tool & Supply Co., New York.
Sellers & Co., Inc., Wm., Philadelphia, Pa.
Vandyck Churchill Co., New York.
Wormer Mchy. Co., C. C., Detroit, Mich.

Drilling Machines, Rail

Foote-Burt Co., Cleveland, O.
Newton Machine Tool Wks., Inc., Phila., Pa.
Niles-Bement-Pond Co., New York.
Prentiss Tool & Supply Co., New York.
Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.
Standard Tool Co., Cleveland, O.

Drilling Machines, Turret

Fay Machine Tool Co., Phila., Pa.
Niles-Bement-Pond Co., New York.

Drilling Machines, Upright

American Tool Works Co., Cin., O.
Baker Bros., Toledo, O.
Barnes Co., W. F. & John, Rockford, Ill.
Beaman & Smith Co., Prov., R. I.
Boynton & Plummer, Worcester, Mass.
Celfor Tool Co., Chicago, Ill.
Cincinnati Mach. Tool Co., Cincinnati, O.
Clark, Jr., Elec. Co., Inc., Jas., Louisville, Ky.
Davis Machine Co., W. P., Rochester, N. Y
Fosdick Mach. Tool Co., Cin., O.
Foote-Burt Co., Cleveland, O.
Gould & Eberhardt, Newark, N. J.
Harrington, Son & Co., Edwin, Philadelphia, Pa.
Henry & Wright Mfg. Co., Hartford, Conn.
Hill, Clarke & Co., Inc., Boston, Mass.
Hoefer Mfg. Co., Freeport, Ill.
Kern Mach. Tool Co., Cincinnati, O.
Knight Machry. Co., W. B., St. Louis, Mo.
Marshall & Huschart Machry. Co., Chicago, Ill.

Drilling Machines, Upright —*Continued.*

McCabe, J. J., New York.
Mechanics Machine Co., Rockford, Ill.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
New Haven Mfg. Co., New Haven, Conn.
Niles-Bement-Pond Co., New York.
Prentice Bros. Co., Worcester, Mass.
Prentiss Tool & Supply Co., New York.
Rockford Drilling Mach. Co., Rockford, Ill.
Sellers & Co., Inc., Wm., Philadelphia, Pa.
Sibley Machine Tool Co., South Bend, Ind.
Slate Machine Co, Dwight, Hartford, Conn.
Sloan & Chace Mfg. Co., Newark, N. J.
Taylor & Fenn Co., Hartford, Conn.
Vandyck Churchill Co., New York.
Whitney Mfg. Co., Hartford, Conn.
Wiley & Russell Mfg. Co., Greenfield, Mass.
Wormer Mchry. Co., C. C., Detroit, Mich.

Drills, Center

Cleveland Twist Drill Co., Cleveland, O.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pratt & Whitney Co., Hartford, Conn.
Slocomb Co., J. T., Prov., R. I.
Standard Tool Co., Cleveland, O.

Drills, Electric

Clark, Jr., Elec. Co., Inc., Jas., Louisville, Ky.
Independent Pneumatic Tool Co., Chicago, Ill.
Van Dorn Elec. Mfg. Co., Cleveland, Ohio.

Drills, Flat

Celfor Tool Co., Chicago, Ill.
Whitman & Barnes Mfg. Co., Chicago, Ill.

Drills, Hand

Cincinnati Electrical Tool Co., Cincinnati, O.
Clark, Jr., Elec. Co., Inc., James, Louisville, Ky.
Coates Clipper Mfg. Co., Worcester, Mass.
Hisey-Wolf Mach. Co., Cin., O.
Ingersoll-Rand Co., New York.
Niles-Bement-Pond Co., New York.
U. S. Electrical Tool Co., Cincinnati, O.

Drills, Pneumatic

Clayton Air Compressor Works, New York.
Independent Pneumatic Tool Co., Chicago, Ill.
Ingersoll-Rand Co., New York.

Drills, Ratchet

Armstrong Bros. Tool Co., Chicago, Ill.
Cleveland Twist Drill Co., Cleveland, O.
Hisey-Wolf Mach. Co., Cin., O.
Parker Co., Chas., Meriden, Conn.
Pratt & Whitney Co., Hartford, Conn.
Rogers Works, John M., Gloucester City, N. J.
Standard Tool Co., Cleveland, O.

Drills, Rock

Ingersoll-Rand Co., New York.
Northern Electrical Mfg. Co., Madison, Wis.

Drill Speeder

Graham Mfg. Co., Providence, R. I.

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See Grinding Wheels.

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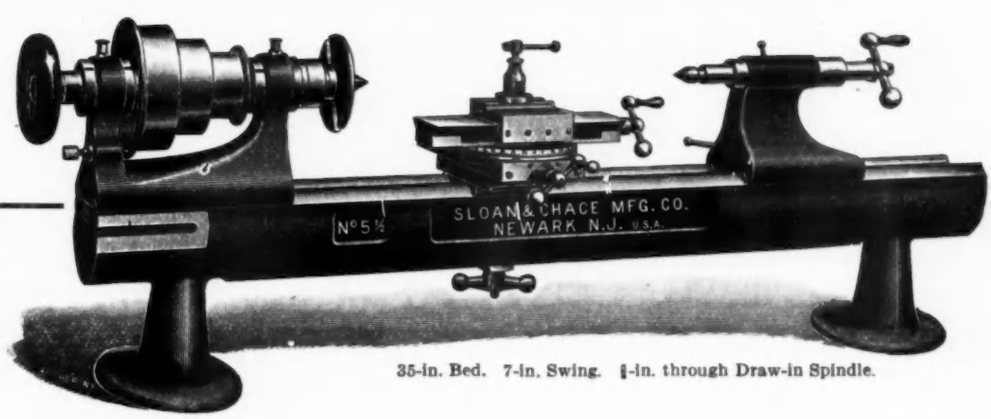

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Taylor-Wilson Mfg. Co., McKees Rocks, Pa.
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Grant Gear Works, Boston, Mass.
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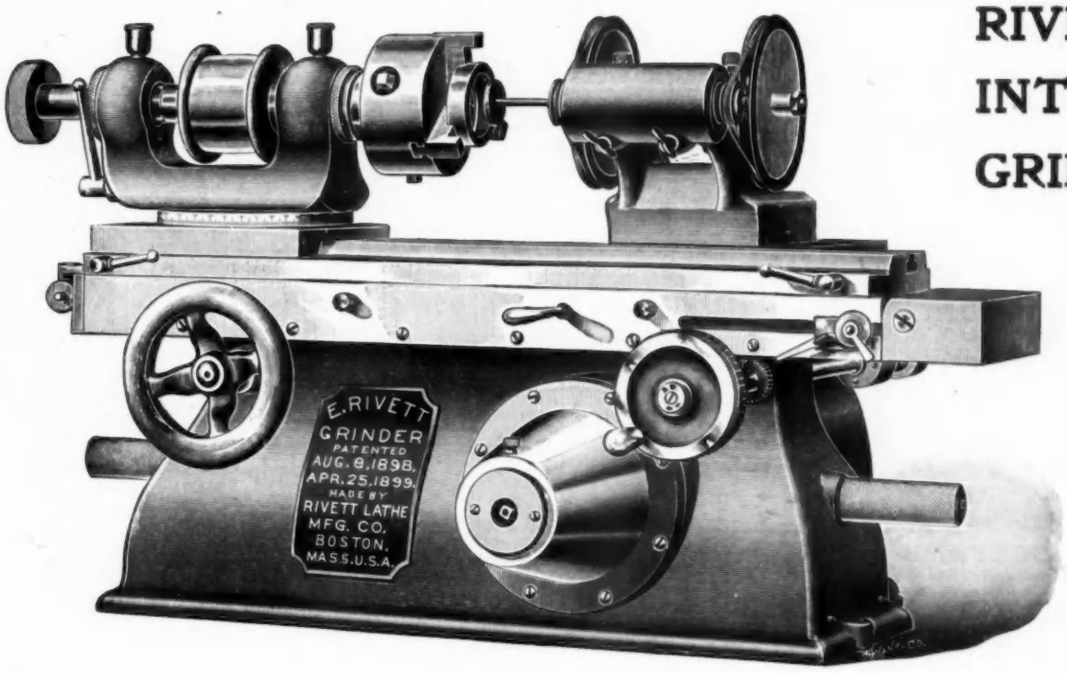

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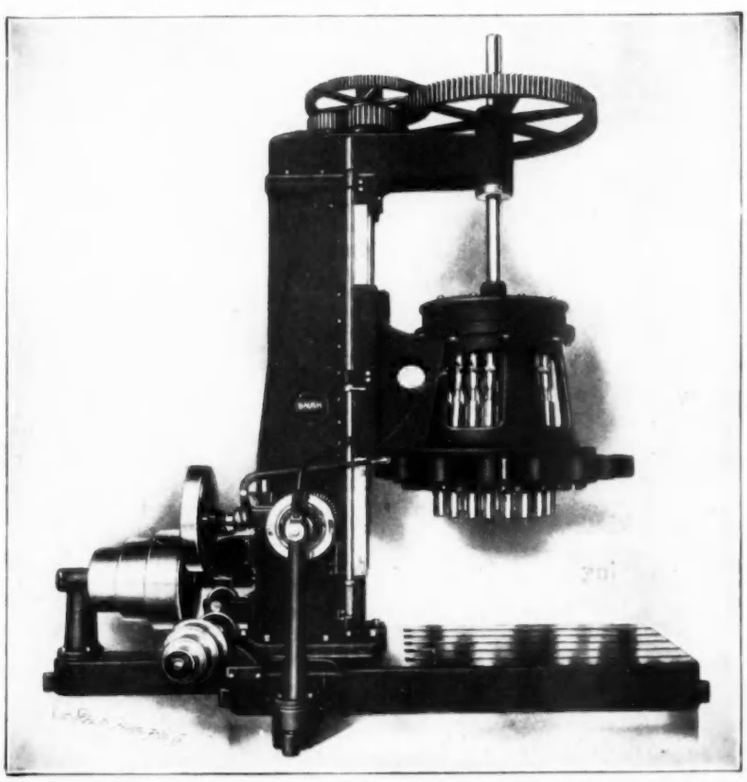

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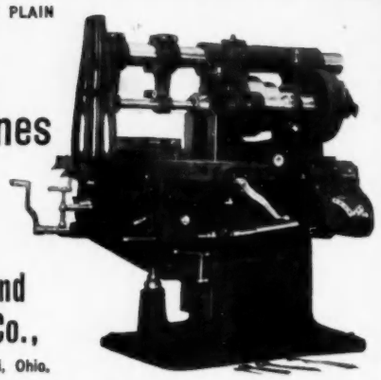

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